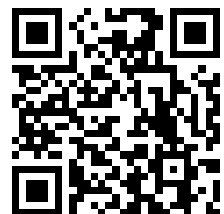


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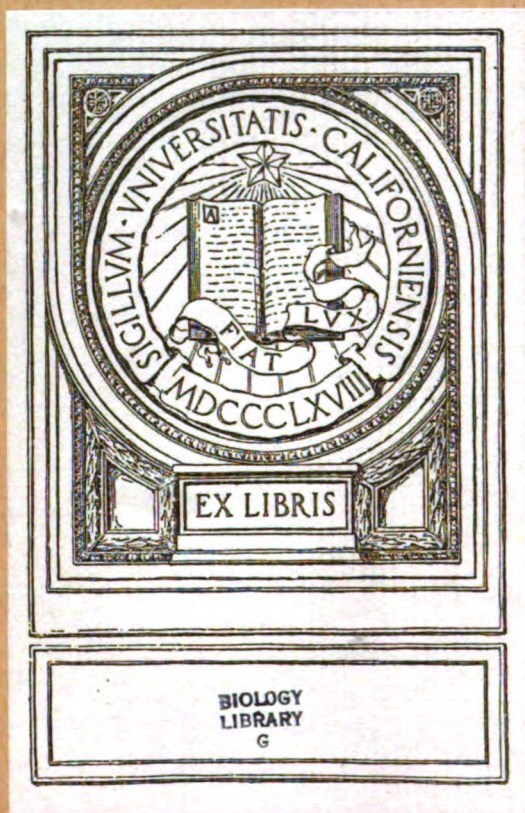
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OF THE

# Royal Army Medical Corps

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OF

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## Royal Army Medical Corps

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Original Communications.

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SERVICE ARCHITECTURE, AND THE REQUIREMENTS OF  
ACCOMMODATION IN TROPICAL AND SUBTROPICAL  
COUNTRIES, WITH SPECIAL REFERENCE TO EGYPT  
AND PALESTINE.<sup>1</sup>

BY SQUADRON-LEADER P. M. KEANE.  
*Royal Air Force.*

In the broad days of Spain, when large numbers of her people were being attracted to South America, the Spaniards were quick to adapt native habits and medicines to their own requirements. For instance, they were the first Europeans to employ ipecacuanha for dysentery, which followed their penetration of South America, where they found the drug in general use. As far back as the middle of the seventeenth century the introduction of cinchona into Europe was brought about by the Comtesse de Cinchante, who discovered it in use during her residence in Peru, where her husband was Viceroy. It will be shown presently that the modern French colonist is alert and receptive in such matters, particularly in relation to building, whereas where we have settled abroad we have too often introduced our home style of building.

The present is perhaps a suitable opportunity for attracting attention to the question of Service architecture and the requirements of accommodation in tropical and subtropical countries. The constructions erected in the past are in danger of being looked upon as traditional, and even if this

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<sup>1</sup>Reprinted by kind permission from the War Section of the *Proceedings of the Royal Society of Medicine*, April, 1927.

## 2. *Service Architecture in Tropical and Subtropical Countries*

danger is not real. The scientific developments of the past fifty years invite a review of the subject.

If we were to cast our memory back and review British overseas stations, we should recall a great number of cases of siting and of laying-out which can be best described as accidental, or alien, and which have grown up in haphazard fashion through a series of annual increments. The result is a widely scattered mass of buildings which are obviously hygienically unsuitable and costly.

Political and strategical conditions abroad frequently impose the provision of entirely new, or additional accommodation, at comparatively short notice for an indefinite number of years. The question of this provision is a very difficult problem. In the majority of cases only semi-permanent or temporary structures are erected.

Semi-permanent buildings are dangerous, not because they may fall down too quickly, but because they may remain up too long. And yet I believe it is not impossible to provide hygienic and economical buildings of this kind overseas, given, first, that every aspect of the subject is thoroughly explored, and provided that the favourable results obtained from that investigation are then adhered to, without the intrusion of innovation. I think it will be admitted that the results obtained from permanent Service accommodation in general are more satisfactory than those from semi-permanent buildings.

The idea of building one's own house has occurred to us all at some stage of our lives. If attempted, the realization would too frequently prove to be a failure through lack of mature consideration, and lack of collaboration with experts. A building proposal, whatever its type, should not be embarked upon unless it is clear in the beginning what the completed scheme will be. Once it is commenced it should be carried through without interruption or amendment.

Assuming that we have only to consider permanent structures, what is the position to-day, and how have scientific discoveries and inventions during the past fifty years aided us to determine: (1) What is the ideal site? (2) What is the ideal lay-out? (3) What is the ideal ventilation? (4) What is the ideal structure? (5) What is the ideal interior?

These are very important questions which now await answers, for it is only by knowing something about the ideal that we can work out what is practicable. Before dealing with them it would be as well to put a simpler and more comprehensive question. What is the ideal dwelling anywhere? It is one conditioned by circumstances of the country, and one providing the maximum of protection against adverse climatic conditions, and affording the greatest degree of safety and comfort. Any building which fails seriously in these respects is an anachronism.

In any overseas country valuable assistance in design and construction may be obtained by studying the building traditions of the natives, particularly those of the ancient dwellers. I am afraid that in certain respects

the modern better-class native dwelling has been adversely affected by the introduction of European styles, so that the amount of guidance from that quarter may be small. When we study ancient buildings in the East we observe that the amount of exterior surface was reduced to a minimum and that the amount of light admitted was strictly limited. Great thickness of walling and roofing was regarded as being essential. In the days of the Pharaohs the roofs of the houses of well-to-do Egyptians were several feet thick, and consisted of a row of palm trunks overlaid with rushes or palm leaves covered by a thick layer of mud, the rooms being grouped within an exterior simply comprising four walls.

The Egyptian temple building is summed up in the words "thickness" and "darkness." The Romans, in Africa, went so far as to burrow underground in order to find coolness and built dwellings entirely below ground level, whither the more fortunate members of the population retired during the summer months. The same principle was followed by the Babylonians. The modern Baghdadians do much the same. India exhibits to-day many signs of the care bestowed by the ancients on the provision of vast cool interiors, as evidenced by the rock temples still existing there.

The ancients, therefore, considered a cool interior more important than a well-aired one, for many of their buildings, specimens of which remain to-day, were neither orientated nor constructed to enjoy the effects of a through current of air. They argued, no doubt, that when the sun was up a cool retiring place was the first consideration, and that when it had set, if one wanted to enjoy the breeze and to obtain some degree of freedom from winged insects, the best thing to do was to go outdoors and sleep there.

At the present, what importance is attached to the housing of personnel overseas?

The French, in Morocco, have recently grappled with the question; they found that the European types of dwellings which they had previously erected there were definitely unsuited to the climate. Under the direction of Marshal Lyautey, the erection of unsuitable types was checked, and after a period of investigation and study of old Moroccan buildings, a new type, by which the native forms were adapted to new purposes, was evolved, or in other words, a Franco-Moorish type was established. Anyone who is called upon to build in hot countries can do no better than adopt a similar system, or perhaps pay a visit of study to Morocco, and especially to the Government administrative buildings at Rabat.

I will now reply to the questions dealing with the ideal site, lay-out, ventilation, structure and interior, and discuss various points which have struck me in connexion with them during my service abroad. Some are very obvious, and others largely matters of opinion, and I shall at once explain that features which might be considered applicable to Upper Egypt might not be adaptable, for instance, in Ceylon.



## 4 *Service Architecture in Tropical and Subtropical Countries*

### SITING.

Unless dominated by strategical policy this question is comparatively simple. It is important that a site should be as exposed and as high as possible in relationship to the surrounding ground surface, which in turn should be devoid of vegetation and habitations. In this way only can the full effect of any prevailing wind be utilized, and freedom from winged insect plagues be enjoyed. No site should ever be considered without a liaison with the Civil Health Authority of the country. Failure to do so in the past has led to disaster. When at all possible a survey from the air should be made; this is frequently an aid of the highest importance. An aerial survey of ten minutes' duration will often reveal more features of importance than a ground survey lasting many days, because from a height of a few thousand feet native villages, sources of water pollution, and obscurely located water collections for miles around are usually clearly revealed.

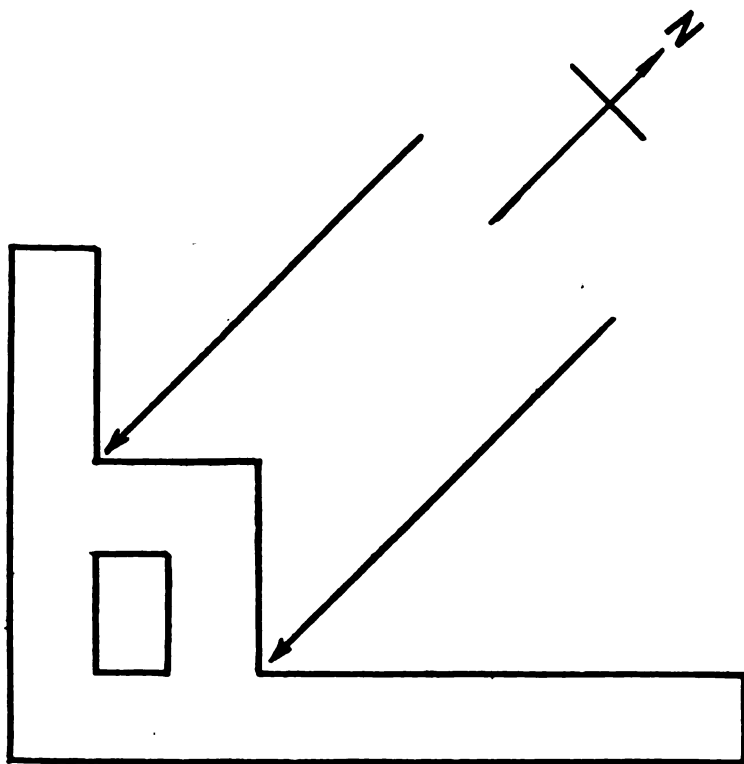
Once the site has been decided upon, a wide tract of land should be obtained in order that it may never become necessary to erect buildings near to the station or cantonment boundary immediately outside which native dwellings, markets or factories are likely to appear. Such land is usually inexpensive. If a site is required on the sea-coast the living quarters should be built as near the shore as possible in order that the effect of inshore breezes may be enjoyed. A quarter of a mile inland, or less, such air movement may be imperceptible at ground level owing to contour obstructions. One usually finds the shore site free from mosquitoes and sandflies, whilst the inland site may be infested with both. Areas over which sand is drifting should be avoided. Water accumulations must be mapped out, and the possibility of mosquito breeding areas estimated. Drainage is important and levels require to be examined. In cities there is not much freedom of choice and land is expensive, the Civil Authority is here again of great assistance. Sufficient land must be obtained to give such unobstructed orientation as will provide ample windage.

### LAY-OUT.

Wind generally determines the lay-out. When a favourable prevailing wind does not exist, or when all winds are unfavourable during hot weather, the buildings should be grouped on the smallest site conformable with adequate ventilation in order to reduce the amount of exterior surface exposed to sun heating. In those places in which the prevailing wind is favourable, as in lands in and adjacent to the Mediterranean, and in certain parts of India, the question of the entire lay-out must be subordinated to this factor. Buildings should not be spaced out in separate groups of small dimensions. The fewer separate foundations the better. Structural requirements may, of course, impose the necessity of a number of comparatively small buildings independently sited; it is possible to obtain some

degree of success with this method, but it makes accommodation uncomfortable owing to the heat, since an excessive amount of exterior surface is exposed to the sun. Unless spacing out is very carefully arranged, insufficient room is available for the wind to pick up again after striking an obstruction. I incline, therefore, to grouping the greatest amount of structure on the smallest possible foundation. It is quite practicable to employ, say, five separate blocks instead of the fifty or more buildings of various sizes such as one often sees.

In order to obtain the utmost perfiation, a block should be L-shaped,



and so placed that the line of force of the prevalent wind point intersects the angle (see diagram, p. 5). Then only will the maximum effect be enjoyed. When the prevailing wind is north, the rectangular block thus orientated offers, in addition, much shelter from sunshine.

As the maximal force is in the region of the angle, at that point an additional block in the form of a square or oblong may be overlaid, in order that the utmost use may be made of the wind, instead of it being allowed to waste itself by rushing practically uninterruptedly from the front to the back.

Conjoined rectangular blocks may be laid behind one another where

## 6 *Service Architecture in Tropical and Subtropical Countries*

good perfilation is obtainable, and a certain amount of mutual shading is thereby afforded ; moreover, shading can be greatly increased by additional structural features without in any way diminishing the wind force. However, planning of this kind is only required in the case of a station of exceptional size.

The back of the building might look to the south-east and the south-west, and need not be used a great deal for entrances, while the front aspect might look towards the north-east and north-west, and so only receive the sunlight in the early morning and again in the evening when the sun is setting in the western horizon. To anyone who knows the East, these are most striking advantages.

The lay-out I have described really exists. It is the nearest to the ideal I have seen. Unfortunately it is not a Service structure but an hotel at Ramleh, near Alexandria. The architect must have approached his task very carefully, for he has produced a vast building the lines of which are simple and the natural ventilation of which is perfect. So wisely is it orientated that the blazing sun of the Egyptian summer appears to treat it with exceptional favour. It is noteworthy, too, that verandahs are not a prominent feature ; only a few rooms have them. So well is the wind trapped that a light breeze produces air movement which is felt even in the most unfavourably located rooms situated on the south-eastern aspect. Many of the rooms have their doors looking south, but this defect is countered by a closed-in corridor along this aspect, which entirely prevents these rooms being overheated from that source, provided simple precautions are followed.

In considering lay-out it is as well at the same time to go into the question of the surroundings of a building. At the present day we see flower-beds, shrubs, and trees in the immediate vicinity of quarters. People protest if we attempt to remove them. No plant obtaining its sustenance from the soil should be allowed to flourish within a distance of about sixty yards of any building where people work and dwell, and even at this distance vegetation should be relegated to an area situated to leeward of all buildings. Native quarters and latrines must be outside this distance.

A good substitute for a garden in a tropical or subtropical country is an enclosed quadrilateral of oblong form, where æsthetic tastes may be satisfied by providing a frieze of coloured tiles easily procurable in the East, which will cost less than the labour required for the repeated irrigation of flower-beds. In architecture the æsthetic must claim equal rights with the purely utilitarian. Successful architecture not only provides shelter for men but also satisfies closely studied environmental needs, not the least of which is a sense of the beautiful ; at its best it is an embodiment of spirit rather than of material.

Before discussing structure we will inquire as to how scientific research during the past fifty years has helped us to site and to build our houses overseas.

## MOSQUITOES AND SANDFLIES.

First come the disease-carrying mosquitoes. It is an extremely tedious and difficult operation to rid an area of mosquitoes, and the prime object should be to select the district as carefully as possible. There is no excuse for the selection of a thoroughly bad site nowadays, although such a misfortune has happened within the decade, and will happen again if those responsible for the choice do not exercise ordinary care and inquiry. Then comes next in order, but of more recent discovery as regards its life habits—the sandfly. The sandfly interdicts flower-beds, gardens, and all vegetal life and moisture, however little, in the region of dwellings. The sandfly's radius of action is probably not more than fifty yards at the utmost. The insect is more of a hopper than a flier; air movements, even gentle ones, provide an effective barrier to its progress in any direction and cause it to seek refuge immediately.

## VENTILATION.

Everyone is familiar with the important researches made in recent years in connexion with ventilation, which, from an adverse physical and mental standpoint, are summed up in the word "humidity." In what may be conveniently called "low temperature humidity," the individual merely experiences a sensation of great cold and can usually escape from it at will, but in "high temperature humidity," so general abroad at certain places and times, man is continuously distressed and working efficiency is lowered. We know now that air movement, yet not necessarily that of freshly supplied air, is the remedy. It warrants our keeping buildings closed during the daytime, a principle which would not have been endorsed a quarter of a century ago when frequent changes of air were considered vital. The electric fan enables us to use the same air over and over again for many hours without any adverse effects being felt. When the atmosphere of a well-fanned room becomes stale it is due usually to the odour produced by tobacco smoking, and not to transpired air alone. The Greenwich air purifier, owing to its powerful dehydrating action, should be a valuable apparatus for cooling purposes, provided the cost of the compound employed could be substantially reduced.

What means have we at hand for preventing outer heat being conducted into an interior? Walls several feet thick; but this is a most expensive proposition.

A wall may be doubled by having an intervening air space; that system has not been successful in hot countries, and is mainly due to the very marked radiation inwards from the outer division of the wall. The radiation raises the temperature of the air in the middle section, which may conceivably rise many degrees above that of the outer air shade temperature. The intended function of the air space is, in consequence, negated. With the strong present-day tendency to innovation in wall and roof construction, careful research under actual tropical conditions is essential, because even

## 8 *Service Architecture in Tropical and Subtropical Countries*

after various methods have been tried no definite solution has been forthcoming. Recently, in England, a firm has produced a combination of materials consisting of layers, from within outwards, of coke-breeze, cork and cement, possessing remarkable insulating properties along with the advantages of cheapness. In the tropics, with a core of adequate thickness, this type of wall may provide an inexpensive solution to this problem.

Wall construction is the very acme of building success in the East. A builder must aim at providing a wall (and roof) which will prevent the temperature wave from the exterior reaching the interior between the morning and the afternoon, and during a maximal period, therefore, of about nine hours.

Double windows, which are employed on the Continent to keep out the cold, could be used with great success in hot countries to keep out the heat. The single window does not do so in any marked degree, because of its great size and the manner in which the interior air is driven against it through movements caused by occupants or by the electric fans which are employed. Those who live in hot countries can readily verify this fact by comparing the temperature of the window glass on its inner surface with that of the adjacent wall interior when the exterior shade temperature has reached 100° F. The amount of wall space given up to glazing in Egypt is extraordinary, and can only be justified if the windows are double. In my opinion, glazing is grossly overdone in the East, and often renders buildings suitable only for winter residence. In addition, such windows admit too much light. By doubling them and reducing their surface area sufficient illumination is available during the daytime, and ample perfilation is assured during the night hours, when streaming air can be employed with advantage.

Compressed or refrigerated air is an agent which in a hot country can alter the whole aspect of indoor life from one of distress and fatigue to one resembling life in a northern latitude. Leonard Hill refers to this in his important work on ventilation, in which he says that "for cooling tropical houses compressed air douches could be used, as air escaping from compression is both cool and dry." I feel certain that one day his suggestion will be adopted. Initially, the provision of the various parts of such ventilating system is expensive, though once the installation has been completed the running cost is negligible. It means a particular method of insulation of floor, wall, and roof with cork sets, and therefore implies new construction of a deliberate kind. Everything is at hand to enable such a system to be employed. It is the old question—finance. If cheaper materials could be substituted, such a method would no longer be impracticable from a Service point of view, and probably would be first introduced in order to provide accommodation in a special hospital ward for treating cases of serious illness. Great relief would be provided for the patient if the room temperature registered 70° F., the exterior shade temperature being 115° F.; there would be no mosquitoes, consequently no mosquito nets, and no sandflies.



The cost for an eight-bedded ward with a refrigerating air douching plant would exceed that of an ordinary ward of the same number of beds by about £3,000; there is not a correlative rise in cost as the number of beds allotted is increased.

I look forward to the day when refrigerated air will be laid on to quarters abroad; the cubic contents of such quarters need not be large. When one considers the amount of space taken up by a ship's company of 500 men in a cruiser, it will be seen that the space required is very small. In the tropics it is better to sleep in a room eight feet square by six feet high, the temperature of which is about 65° F., than to attempt to do so in a large hall with a temperature almost double that figure. Under such a régime sickness ratios would reflect a marked reduction in insect-borne diseases, and possibly in general diseases.

If we place on the debit side the expense of erecting buildings with vast interiors fitted with numerous electric fans, involving heavy and continuous charges for mosquito nets, together with losses through ineffectiveness, hospitalization, and other items—and on the credit side a few air-cooled buildings—I think the latter method would prove to be the less costly of the two.

#### STRUCTURE.

The vital part of the problem of accommodation is structure, so full of detail; so fruitful of failure. It is a very large subject, and I have already touched upon it. Anyone who has lived in a hot country will agree that the smaller the houses and the greater their exterior surface, in proportion to that of the general interior, the more costly will they be in comparison to massed structure, and the more difficult to keep cool during the daytime. A station consisting of numerous small buildings or pavilions is therefore only justifiable on a temporary basis, for the design carries in its train scarcely a single redeeming feature.

Before designing the structures required on a general lay-out, the needs of every department represented must be considered, and a place given to each. This means grouping. It should be possible to group the various sections on about half a dozen separate areas. Generally speaking, everything relating to the daily life of the man, whether he be a soldier or an airman, should be carried on upon the one foundation, with a few exceptions. You may not build men's quarters on the top of hangars, engine testing shops, or stables; but you can group all noiseless departments such as certain workshops, schools, cinemas, canteens, &c., on the ground floor. Above these you can place men's and serjeants' quarters, ablution and sick quarters. That leaves a group of noisy and objectionable trades, and transport quarters, two groups of married quarters and officers' quarters, each to be given their separate sites.

I know there is a tendency at the present day to build quarters on the widely scattered pavilion system so as to minimize the results of possible air attacks. That may apply at home, but it should not do so abroad where

## 10 *Service Architecture in Tropical and Subtropical Countries*

the question of housing must accommodate itself to the particular climatic condition. It need not be a great disaster for any complement of personnel in a hot country suddenly to find itself homeless, provided tentage is in reserve and rapidly available. But to oblige people in the tropics to dwell permanently in what might be called emergency-of-warfare buildings is both unwise and unfair.

Stations built on the group method have much to recommend them. The maintenance charges never become abnormal. They suit climatic conditions. They are easily guarded against invasion by thieves and ground enemies, and if they are no longer required for military purposes, the likelihood of obtaining a reasonable price for them is fair compared with the possibility of getting a good price for a pavilion station, which has only a breaking-up value. The only possible disadvantage is the one I have mentioned—relative vulnerability—in itself a debatable point.

In dealing with the question of structure certain broad lines should be followed. (Discussion of advantages and disadvantages, which would take an interminable time, is omitted.)

- (1) Buildings should be two or three stories high.
- (2) Framework of steel.
- (3) Constituents of walls should be of insulating material.
- (4) Windows should extend down to floor level.
- (5) The amount of wall section allotted to windows should be sparingly regulated in living quarters.
- (6) Windows need not be more than a foot wide all the way up, and should be doubled.
- (7) Both sections of the window should open inwards, and external shading should be provided. In workshops double windows should also be provided. Greater glazing space may have to be allotted on account of lighting, but the amount of area given to glazing should be strictly controlled.
- (8) Floors should consist of material other than wood.
- (9) Doors should be thick and all main entrants should be doubled.
- (10) The exteriors of buildings should be white or cream.
- (11) Roofs should, wherever possible, be flat and entirely insulated from the underlying ceiling. If pitched roofs are employed, considerable care is needed to provide against heating of the interior through failure of insulation or through faulty design. Large (triangular) openings should be provided at each end of the ridge to allow the heated air in the garret to escape freely. White uralite sets are perhaps the best for this type of roof; they can be more readily transported than the Marseilles tile. I do not consider that corrugated iron sheeting, even galvanized, is a suitable material for roofings.

Before taking up the subject of the interior of buildings the question of verandahs should be discussed. The verandah is in a sense half interior, half exterior. In most hot countries it performs a double function, namely :

(1) as a shelter from sunshine; (2) as a protection from dewfall. It is not, however, a building essential, but rather a luxury or an expedient, the existence of which can never wholly compensate for what is an otherwise faultily constructed dwelling.

We generally find a verandah at ground level, and it is to be regretted that we do not go a step further and add to it in stone or brick so as to convert it, at least on the southern aspect of the building, into an enclosed corridor with windows and shutters capable of being thrown open freely at night time. The effect of this provision often makes all the difference between a stifling interior and a cool one, no matter at what time of day. Such a scheme can go a long way towards redeeming a faultily constructed building, and at the same time it adds a very considerable quantity of what may be called air storage, which is secured each day by closing a building during the early forenoon. This structural provision has another advantage in that the outer wall, as it now becomes, fulfils the additional function of keeping out reptiles, a service which would otherwise devolve on the more internal entrants and therefore interfere with air perfilation through rooms at floor level.

In a new construction the place for a verandah is at the topmost storey and not the ground floor. By causing the roof to project several feet beyond the wall and constructing a balcony all round the top floor, a most admirable construction is achieved, which will also act as a sunshade for the entire exterior of the floor immediately below it.

#### INTERIOR.

When the demands of site, lay-out and structure have been wisely met, those of the interior will have been in a large measure solved. Where these demands have been ignored, only extensive and costly re-conditioning will prevent the full disadvantages of a hot season being experienced.

The amount of interior cubic space per head is definitely laid down for the Services and varies in amount according to whether the climate is tropical or subtropical. The amount is sufficient for living quarters. In many workshops, however, in the Air Force, it is greatly in excess of requirements and is incidental to the needs of air-craft construction, which implies vast and lofty interiors that can be kept cool during working hours as long as certain rules as to the construction and occupation are obeyed. The rule frequently followed in temperate climates, namely, the fact that an interior height above twelve feet is unnecessary—does not apply in hot countries where the air is kept in motion by mechanical means, and where lofty interiors are of the greatest value. At home stations interiors as much as seventeen feet in height are observed, while abroad they may be only eleven feet high. One wonders, therefore, how the air in the former can ever be made warm in the winter and in the latter kept tolerably cool in summer. Abroad, every foot added to an interior height is of the greatest importance. This is a point which is rarely neglected by builders

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of good-class private dwellings for natives and Europeans. Domestic interiors should generally not be less than sixteen feet high, except where cooled air douching is employed, in which case it is possible to build as low as even eight feet, and thereby effect a marked economy in the cost of the actual structure so far as the building itself is concerned. A great fault of home-trained designers, in their planning of tropical buildings, is that they cannot free themselves from the rules governing house construction in temperate latitudes. More light, more air, more sun-rays are not required within dwellings in the tropics. What is required in the day-time out there is little light, trapped cool air and no sunshine, no fanlights, no air bricks, &c.

We are accustomed at home to whitewash interiors, and that is almost the rule abroad, although, for obvious reasons various shades of green are indicated; blue reflects less light than green, but it should not be employed on account of its depressant action.

The necessity for fireplaces is frequently overlooked. There are few stations abroad where they are not required in day-rooms, at least, and at some they are an absolute necessity during the greater part of the cold weather. It is extremely important, in India and Egypt, to ensure that no interior dormitory or bedroom fittings, such as shelves and wardrobes, are fixed. They must invariably be detachable, otherwise it will be well-nigh impossible to rid such quarters of bed-bugs once they become infested. The amount of wood-work in sleeping quarters should, for the same reason, be kept at a minimum, and wood should never be employed in the construction of ceilings. Floors should be paved.

The use of electric fans is now almost general at all stations abroad in the Air Force; no bedroom or dormitory is without them. Their installation has cost thousands of pounds, but the outlay has been justified because, following their introduction, the incidence of sandfly fever has fallen rapidly; it has been reduced to negligible proportions in Egypt and Palestine, where, in 1925, a total of only fifty-five cases, or 20·1 per 1,000, was notified, compared with several hundred, or 105·6 per 1,000, in 1922. For dormitories ceiling-fans are better. For smaller rooms oscillating desk-fans should be employed. As oscillating desk-fans are costly and easily damaged, they should be fitted on brackets, in convenient places, such as corners, and protected by a large mesh rabbit-wire in order to prevent the men interfering with them. In that way much money, otherwise wasted, would be saved.

Is it possible to render quarters abroad fly-proof? It is most difficult to do so with the existing types of buildings, because the entrants are so many and the space given to windows so extensive that the barriers are generally permeable. If a building is constructed with the intention of fly-proofing it, the proposition becomes a simple one.

Refrigeration apart, if buildings are constructed on the lines now described, it should mean a reduction of the mean interior day temperature

by about 5° F. This is of vital importance in its effect on human comfort.

Lastly, the insistence of standardization should not be forgotten. Standardization means consolidation of the results of research and careful investigation in Service architecture, and prevents the re-entry of that philistinism for which Service builders are unfortunately so notorious. Standardized plans cannot be applied universally in the tropics and sub-tropics. However, with limitations, they can be widely and successfully adopted. Standardization should not be rigid, but should be susceptible to new influences.

Building abroad is not really attended by profound difficulties. The questions arising from it are, however, more intricate and diverse than at home. Before a higher standard of accommodation overseas can be achieved, a break-away will have to be made from the position of regarding the question of housing in hot countries as being merely one of additional cubic air space per head. It is a more exacting problem than that, as I have endeavoured to show. Not only must the architect enlist the assistance of the sanitarian and the entomologist, but he should more and more claim the help of the physicist. As we move towards perfecting our overseas accommodation, I feel confident that our task will be greatly simplified by the aid of the physicist, and it is from that source that the most surprising improvements in housing in the tropics are likely to ensue. Everyone is aware of the magnificent work being done by Sir Edwin Lutyens in building the new Delhi, and one may ask that the Services may be given the benefit of labours in the same direction and the same spirit. Indeed, that is the dominating motive of my address, namely, to plead that investigation and research may invade the whole field of building in hot countries, in order to estimate accurately habitative needs, to interpret them, and in so doing to make a vital contribution to a problem that has long awaited elucidation.

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## ANTIMALARIA WORK AT MOASCAR, EGYPT, IN 1925 AND 1926, AND THE RESULTS COMPARED WITH THE PREVIOUS TWO YEARS.

By MAJOR KENNETH COMYN.  
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IN writing these lines on the work done at Moascar, and comparing the malaria incidence of the past four years, a marked reduction is obvious, but whether this is due to antimalaria measures or to other causes it is difficult to say with certainty. But certain it is that if adequate measures are not taken a grave danger of a big epidemic is always present in this station.

### HISTORICAL.

Perhaps a few words on the history of Ismailia and malaria in the district will not be amiss.

When the Suez Canal was made, De Lesseps intended Ismailia and Lake Timsah, on which it is situated, to be the chief harbour and coaling station. The Sweet-water Canal from Cairo to Ismailia was constructed in 1877 and deepened in 1882. Malaria reports show that 300 cases occurred between August and December, 1877, in Ismailia; cases increased steadily in number up to a maximum in 1891, when 2,593 cases were recorded. In 1899 the discovery of the transmission of malaria by the mosquito was made by Sir Ronald Ross. In 1902 Major Ross, brother of Sir Ronald, came to Ismailia, under the auspices of the Suez Canal Company, to tackle the malaria problem. From that time the number of cases rapidly diminished, until in 1906 there were none recorded, and since that date no cases have been contracted in Ismailia town. The fact remains that the Suez Canal Company was prevented from making Ismailia its main harbour and coaling station on account of malaria, and for this reason Port Said owes its present existence.

### STATISTICS OF MALARIA IN EGYPT.

#### "A." *Civil.*

Accurate statistics of malaria among the civil population are not available.

The preliminary report of the Anti-Malaria Commission of 1919 gives tables of malaria cases reported from 1913 to 1917, but these can only be comparative and not exact; they show that malaria is endemic throughout Egypt, both in the cities and towns, e.g., Cairo, Port Said and Suez, as well as in the villages.

The report states that: "It is not a disease which occurs in epidemic form, nor does it cause a high mortality, but is generally endemic." . . .

"It affects principally children, adults acquire a relative immunity, the cost of which is a lowering of vitality." . . . "It is impossible to discover every case of malaria, and to destroy the millions of parasites which this natural reservoir carries." . . . "It is not easy to prevent the propagation of cases of malaria, nor to prevent the entry of persons suffering from it into a country free of it." . . . "The number of cases therefore in any certain locality is not easy to fix." . . . "The most satisfactory method of determining the malaria incidence under these circumstances is by spleen-count." "It suffices for the time being to apply the method of spleen-count to appreciate the value of local measures undertaken against malaria."

*"B." Military Statistics.*

As regards the military population, no reliable statistics of malaria in specified areas of Egypt are available prior to 1923. From August 1, 1914, to December 31, 1919, they are embodied in the official medical history of the war. For 1920 no definite statistics were published, and for 1921 and 1922 the malaria statistics were combined for Egypt and Palestine.

Moascar is situated two miles west of Ismailia and originated during the war.

Three sections of the B.E.F. for the defence of the Suez Canal were organized early in 1915: No. 1 section with headquarters at Suez; No. 2 section with headquarters at Ismailia; and No. 3 section with headquarters at Kantara. The camp at Moascar was subsequently started.

THE COMMENCEMENT OF ANTIMALARIA WORK IN THE CANAL ZONE.

The work done at Ismailia by Ross has been mentioned above. A considerable sum of money was spent, and work done at Kantara, first by the military authorities, in 1915, and later, at the instigation of the Anti-Malaria Commission, by the Government of Egypt. Similar work was done at Suez.

At Moascar the antimalaria work seems to have been started in earnest by Major N. Low, D.S.O., R.A.M.C., in 1923, and consisted mainly in draining and oiling certain local marsh lands, supervising cultivated irrigated areas in the vicinity of the camp to prevent breeding of mosquitoes, and the usual antimosquito work in the camp itself. By these means malaria had undoubtedly been kept in check.

In October, 1924, a thorough investigation of the possible sources of infection in Moascar was made, following which the present antimalaria scheme was devised in November, 1924, combining antimosquito measures and malaria prophylaxis.

## GENERAL PRINCIPLES.

Considering firstly general principles, the problem was tackled on two main lines :—

- (1) To eradicate the source of infection.
- (2) To eradicate the carrier, i.e., the anopheles mosquito.

Of these two there is no doubt that the former is by far the more important. It is a fact often forgotten, that it is not the number of anopheles present in a camp that constitutes the real danger, but the number of *infected* anopheles. So often a great and even expensive effort is made to keep down the mosquito population, while no effort is made to prevent the remainder of the anopheles from becoming infected, nor to demarcate danger zones.

The source of infection may be threefold :—

- (1) Civilian infected population.
- (2) Chronic military infected cases, i.e., recurrences.
- (3) Acute military infected cases, i.e., existing and unrecognized.

(1) The first source, as a rule, cannot easily be dealt with on the score of expense and difficulty of administration, *vide* notes from the report of the Anti-Malaria Commission above. If it were not for these there is no doubt malaria could be stamped out among the troops.

It is therefore of the utmost importance to be aware of the extent and locality of this danger.

Inquiries from the local M.O.H., and subsequent reports from the Ministry of Health, Egypt, established the fact that in the villages in the neighbourhood of Moascar on the south and south-west, there was a sixty-nine per cent positive splenic malaria index. Several such villages are within half a mile of the south side of the camp.

Daily reports from the M.O.H. showed that malaria is non-existent in Ismailia town, with a population of 18,000, two and a half miles from the infected villages, and on the windward side during the prevailing wind of the summer.

Furthermore, inquiries from patients in the wards, in October and November, 1924, elicited the fact that a very large proportion of them had been on night guard at Nefisha pumping station, within a quarter of a mile of Nefisha village, ten or fifteen days prior to their admission to hospital.

It appeared probable, therefore, that the chief source of infection was from the infected villages south and south-west of the camp. It was accordingly decided to give prophylactic quinine to night guards, at first only those at Nefisha pumping station, but later to *all* night guards in camp, from May 1 to October 31.

(2) To deal effectively with possible recurrent cases, i.e., the chronic military source of infection, *all* men with a malaria history were recorded on rolls at the medical inspection room, and were ordered to parade every Saturday or Sunday morning, whichever was more convenient regimentally,

for a ten-grain dose of quinine, starting on May 1 and continuing up to October 31.

(3) Recurrences after primary infection were prevented as far as possible by giving a full three months' course of treatment with quinine. Acute cases in hospital were isolated in a special malaria ward, and stringent regulations as to mosquito nets, and careful supervision of the nets by the M.O. in charge of ward and the orderlies, were enforced.

The following is a summary of all measures adopted :—

(1) A register was maintained of all malaria cases, both primary and recurrent, recording their histories, and notes of recent movements, duties, guards, etc.

(2) A visit was made to the local Medical Officer of Health, and inquiries made as to the incidence of malaria in the town of Ismailia and surrounding villages. Daily health reports were received from him and comparative charts kept.

(3) A mosquito squad, consisting of a N.C.O. and three men, was organized and trained to search out and destroy all larvæ breeding in the camp, and a record of all such findings was kept.

(4) Careful supervision over all the cultivated and swampy areas in the vicinity of the camp was exercised. This had already been started by Major N. Low, in 1923, and men were employed, some by the local health authorities and some out of Army funds, on cleaning channels and oiling pools.

(5) A considerable number of mosquitoes were captured and examined to establish the species and proportionate numbers of each.

(6) A scheme of treatment was formulated by which every malaria patient had thirty grains of quinine daily for three weeks, and thereafter ten grains for six consecutive days out of every seven for a further period of two months.

(7) Nominal rolls were prepared in the medical inspection room, showing every man in each unit with any history of malaria, and every such man received ten grains of quinine once a week from May 1 to October 31.

(8) All night guards were to have five grains of quinine on going on guard, and another five grains on coming off guard in the morning.

#### INCIDENCE OF MALARIA FOR THE FOUR YEARS UNDER REVIEW.

The accompanying table and chart show the incidence of malaria in Moascar during 1923, 1924, 1925 and 1926.

The numbers were obtained from the admission and discharge books, except that a few cases, who obviously contracted their malaria elsewhere, were not included.

The annual strengths are the monthly strengths from A.F. A.31 divided by the number of months. These are not strictly accurate for Moascar, as they include certain detachments at Cyprus, Port Said and Kantara from which malaria cases are not included. On the other hand, these detach-

ments are balanced to a great extent by certain details, e.g., R.A.M.C., R.A.S.C., R.C. of Signals and Brigade Staff, whose strengths are included in those at Cairo, although they are constantly present at Moascar. However, for purposes of comparison of malaria incidence these strengths are accurate enough, inasmuch as the strengths of the out-stations practically never vary.

All the cases in 1925 and 1926 were benign tertian, and none were of severe type. They were easily diagnosed and presented no unusual characteristics.

Up to October, 1924, the rise and fall in the incidence of malaria had been based mainly on the number of primary cases that occurred, no account being taken of recurrent cases or average strengths, but such records are obviously fallacious.

Because a man had malaria two or three years previously in India, Mesopotamia, Khartoum, etc., he is labelled "recurrent" when he gets another attack in Moascar, and is not recorded on health returns or malaria statistics as a local case. But how many of these cases are really primary or fresh infections, and how many are true recurrences?

The probability is that a large number are primary.

One's experience tends to show that recurrences within a few months or a year after a primary attack are moderately common, but recurrences after a lapse of a year or more without an attack intervening are rare.

Undoubtedly, to obtain a true record of the malaria incidence and observe the result of effective antimalaria work, the ratio per 1,000 of strength of all malarias must be taken, including the primary and recurrent cases.

The ratios per 1,000 of all malarias among officers and other ranks in the years under review were: 1923, 92.4; 1924, 76.2; 1925, 18.2; 1926, 13.4. A reduction of 79 per 1,000 in four years, or six-sevenths.

In 1924, 1925 and 1926, there is also a marked reduction in malaria among women and children, as well as in recurrent cases.

#### INFLUENCE OF PREVIOUS INFECTION OF A UNIT.

It may be said that this variation depends largely upon the previous infection of a unit. If the higher malaria incidence of previous years has been due, even only partly, to previous heavy infection of a unit, one would expect the increase to be not only in recurrences but to some extent also in primary cases, by infection transmitted within the unit. But this was not the case.

In 1924, the Argyll and Sutherland Highlanders, who had been heavily infected in India and Khartoum, had a total of 47 cases, but of these only 1 was returned as primary and 46 recurrent. Whereas, in 1923, the R.F.A., who had been heavily infected in India, Mesopotamia and Turkey, had a total of 45 cases, practically the same as the A. and S.H., of which 32 were shown as primary and 13 recurrences.

Taking the units from 1923 to 1926, the A. and S.H. showed the lowest primary but the highest recurrences, and the R.F.A. the highest primary and the second highest recurrent, and if statistical records only include primary cases, then 1924 with only 14 primary cases was the lowest in the four years under review, there being 71 in 1923, 22 in 1925, and 19 in 1926.

But, on the other hand, taking total malarias, 1923 and 1924 were about the same, namely, 92 in 1923 and 80 in 1924—compare with these, totals of 29 in 1925 and 23 in 1926, although since 1924 the strength of Moascar garrison has been increased by over fifty per cent.

It seems probable, therefore, that many primary cases in 1924 were missed as such and returned as recurrent, giving a false impression of the true incidence of malaria.

Furthermore, the other units, although direct from England, always have a considerable proportion of men drafted from foreign service elsewhere, e.g., India, Sudan, etc.

#### COMPARISON OF RECURRENCES BY UNITS.

It is interesting to compare the figures of primary cases, recurrent cases and re-admissions within the year after treatment, of the several units.

Unfortunately, records of men in the R.F.A. and A. and S.H., who had previous histories of malaria, are not available. But we can take the recurrences in the four large units that were together or successively in Moascar in 1924 and 1925, viz., the 1st Leicesters, 1st Norfolks, R.I. Fusiliers, and the 42nd Field Company R.E., in which the numbers of men with previous histories of malaria were available, and compare them with the recurrences in the A. and S.H., thus :—

Unit	Primary	Recurrent	Previous history of malaria	Ratio per 1,000 of cases with previous history of malaria
A. and S.H.	1	46	Not available	Not available
1st Leicesters	4	5	82	148
1st Norfolks	6	—	36	51
R. I. Fusiliers	8	—	33	45
42nd Coy. R.E.	4	—	13	96

We see from this that only five recurrences occurred among a total of 164 men previously infected in four units, or a ratio of 30·4 per 1,000, compared with the A. and S.H. 68·6 per 1,000 of *total* strength, both previously infected and not infected. The four units came under the routine antimalaria measures detailed above.

If the figures of men with a previous history of malaria in the A. and S.H. were available, the ratio per 1,000 of such recurrences would assuredly be even higher.

#### COMPARISONS OF RE-ADMISSION AFTER HOSPITAL TREATMENT BY YEARS.

The figures of re-admissions after hospital treatment should always be recorded, in order to observe the effect of treatment.



In 1923 there were five re-admissions before the end of the year after hospital treatment, in 1924, prior to November, there were fifteen, in 1925 nil, in 1926 nil. These figures include re-admissions of both recurrent and primary cases.

Such figures will obviously vary according to: (1) the chronicity of recurrences; old chronic cases are admittedly more difficult to treat and cure than primaries; and (2) the effectiveness of treatment, both in hospital and subsequently in barracks.

These figures emphasize the importance of:—

- (1) Keeping under observation and treating all men with a previous history of malaria.
- (2) The inclusion in statistical returns of *all* malaria cases.
- (3) The importance of a prolonged course of treatment for at least three months after admission to hospital and of keeping all such cases under medical observation.

#### SEASONAL INCIDENCE.

The charts showing the seasonal incidence are interesting as indicating a very close relationship each year, primary cases not occurring usually before July and dying out completely by the end of November. This is not associated, as is so often the case in India, with the rainy season, but with a rising temperature. The rainy season in Egypt is from November to March, and in Moascar rainfall is at its minimum, consisting of perhaps three or four inches per year only, deposited in as many storms. This is just the period when mosquitoes and malaria are at their minimum.

There are many waterways in Egypt, all derived from the Nile. All villages and towns are dependent on these waterways for their water supplies, as well as for the irrigation of land. Adjacent to these waterways are swamps, partly due to soakage into depressions of land at lower levels than the waterways, or partly due to floodings by overflow. It is in these swamps that mosquitoes breed in vast numbers.

Thus there are two factors in Egypt which affect the development of mosquitoes, and therefore the incidence of malaria:—

- (1) The rise of the Nile, which starts in August and subsides in October, filling up the waterways and increasing the flooded and soakage areas.
- (2) The rise of temperature combined with increased humidity.

The hottest month is July, the temperature often reaching 114° F. in the shade, the humidity rising from July onwards to the end of September. These two, temperature and humidity combined, possibly influence the development of parasites in the anopheles mosquito, as well as the fecundity of the females and the development of the larvæ.

The Commission on Malaria, in its preliminary report of 1919, state their belief that: "If the rising of the Nile began in April instead of August, it is probable that Egypt would be a country greatly exposed to

malaria," and they explain that, owing to the rising of the Nile, the sites or areas of reproduction of the mosquito are greatly increased from August right up to December, but of these months the climatic conditions are only favourable to reproduction of the mosquito practically from August to October inclusive—three months instead of five. This is particularly the case throughout the delta and round the shores of the big lakes near the coast, but it does not appear to apply to such an extent in the neighbourhood of Moascar. The swamps from which the anopheles invade Moascar exist all the year round, perhaps enlarged slightly with the rising of the Nile and the consequent slight increase of level in the freshwater canals.

I believe, therefore, that the main factor concerned with the breeding of mosquitoes around Moascar, particularly the anopheles, is the temperature and more specially the mean temperature of the ground.

In Moascar anopheles begin to come in by the middle of July with apparently the utmost regularity, and are at their maximum in August, before the rising of the Nile can have had any influence. They begin to diminish again in September and die out rapidly in November.

The Anti-Malaria Commission on this point state : " The question of the temperature is of capital importance, the development of the anopheles, as well as the other species of mosquito, is, in a large measure, regulated by the temperature. Thus reproduction is arrested, that is to say, the larvæ cease to develop at a point which is probably not the same for the different species, and which depends also on other climatic conditions. It must not be believed, however, that the prolonged disappearance of the mosquitoes during the winter can in any way impede their very great activity of reproduction during the months of summer, or lessen the heavy infection that results in the country. The north of India and Salonica offer on this point a striking example."

"A mean daily temperature of less than 69° F. can be taken as the degree below which reproduction of the mosquito is probably stopped."

#### THE PREVALENCE AND TYPES OF MOSQUITOES FOUND.

Culicine larvæ are to be found in ditches, pools, etc., in the vicinity of the camp, at all times of the year. They, however, do not appear to mature as mosquitoes between early December and late February, or early March. A few culicine mosquitoes are found during the winter months in the camp but from April onwards increase in numbers.

There is no doubt that culicines hibernate both as larvæ and as imagines.

No anopheles mosquitoes were found in camp during the winter months. They began to appear late in July, and increased in numbers up to a maximum during August to October; very few appeared in November, and they had disappeared by early December. A few anopheles were seen in buildings, etc., outside the camp on the south side during winter months.

No anopheles larvæ could be found after the end of November or before May. It appears likely that the anopheles hibernate in this locality as imagines, the water being too cold for the larvæ to survive.

Anopheles larvæ were not once found breeding in the camp area; sump pits and grease traps, though affording excellent breeding grounds for culicines, appear to be uninviting to anopheles. As regards species—the only two species of anopheles caught during 1925 and 1926 were *A. pharoensis*, by far the commoner, and *A. multicolor*, the latter in small numbers only and late in the year. These breed for the most part in marshy ground in the vicinity of Lake Timsah and the Suez Canal. They were not often found in large pools of stagnant water, especially if the water was at all muddy or dirty, but they were to be found in clean pools wherever there was a plentiful growth of rushes or weeds.

There is no doubt that these two species of anopheles show a marked preference for clean water, whereas the culicines, especially *Culex pipiens*, is to be found breeding in any dirty water, even foul water in sump pits and grease traps in camp.

It seems also that anopheles exercise a very careful selection of sites for laying their ova. At the end of October, 1925, when searching over an area of swampy ground near the camp, one small area was found about 50 yards long by 20 yards wide in which there were 30 to 40 small deep holes, none of them more than 10 to 12 inches in width, and most of them 1 to 2 feet deep, containing clean water; in every one of these holes, without exception, there were ova and young larvæ of *A. multicolor*, while in the shallow, flat pools over the rest of the swampy area,  $\frac{1}{4}$  mile long by 100 yards wide, only exceptionally was an anopheles larva seen, although many of the pools contained clean water and had rushes growing in them.

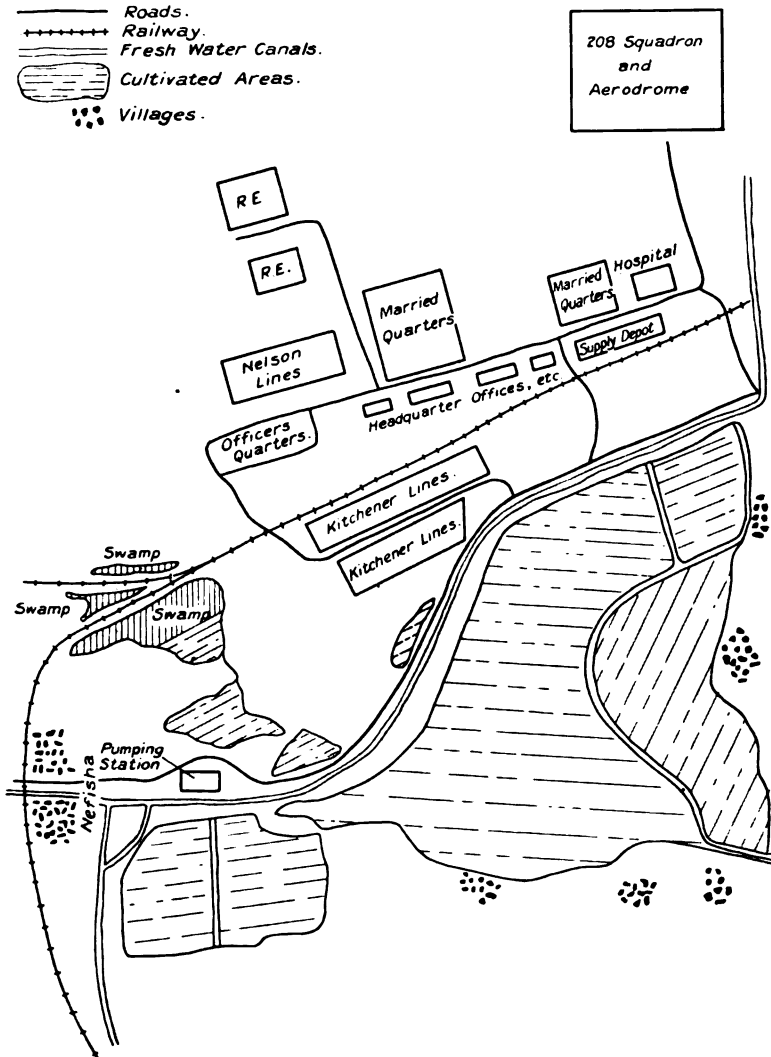
There is no doubt that the small deep pools were selected as affording better shelter from the wind and sun. In nearly all these holes the level of the water was three to four inches below the level of the ground.

The question of prevailing wind did not seem to influence to any extent the number of mosquitoes in the camp. Rough observations were made from time to time of the numbers of mosquitoes found in the wards, and these numbers were found to vary only with the month and not with varying weather conditions or wind.

The prevailing wind during the summer months is from north-east during the daytime, but there is rarely any wind at night; occasionally during the summer, perhaps once every four or five weeks, a breeze comes from south or south-west. The nearest anopheles found breeding on the north-east side of the camp were some two and a half miles away, whereas anopheles were frequently found breeding within half a mile south-west of the camp; yet after carefully treating with oil all such breeding grounds within a mile of the camp, practically no alteration in the numbers of anopheles mosquitoes in camp was noticeable.

The land for many miles along the Ismailia canal is partly swampy and

SKETCH PLAN OF MOASCAR AND CULTIVATION ADAPTED FROM TRACING OF AERIAL PHOTOGRAPH FROM 10,000 FEET.



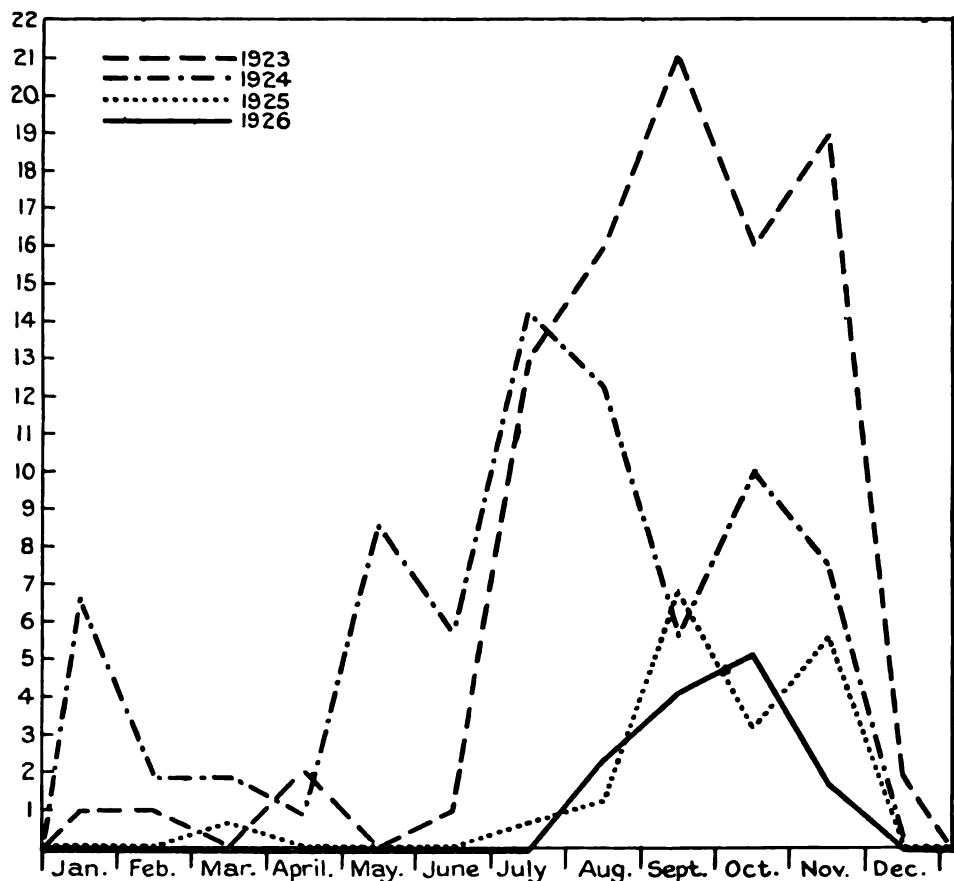
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partly cultivated, so also is it all round the western side of Lake Timsah. These swamps and cultivated areas are controlled and supervised for a distance of about two miles all round the camp, but it is impossible to exercise control for a further distance.

It seems probable therefore that anopheles come many miles from their breeding grounds, irrespective of prevailing winds.

The commonest culicines are *Culex pipiens* and *Ochlerotatus caspius*.

MOASCAR, EGYPT. MALARIA, ALL FORMS—OFFICERS' AND OTHER RANKS' RATIOS PER 1,000 ANNUAL STRENGTH.



### CONCLUSIONS.

- (1) That malaria cannot be stamped out completely; see the finding of Anti-Malaria Commission in Egypt.
- (2) That in all antimalaria work attention to source of infection and

TABLE.

Unit	Average strengths	Primary	Recurrent	Total	Ratio per 1,000 primary	Ratio per 1,000 recurrent	Ratio per 1,000 total	Remarks
<b>1923.</b>								
2nd Duke of Wellingtons	510	19	3	22	37.0	5.8	43.1	—
R. F. Artillery .. ..	296	32	13	45	108.1	43.9	152.0	—
42nd Coy. R.E. .. ..	161	14	2	16	86.9	12.4	99.3	—
Other units .. ..	Variable	6	3	9	—	—	—	—
<b>Totals { Officers and other ranks</b>	<b>995</b>	<b>71</b>	<b>21</b>	<b>92</b>	<b>71.3</b>	<b>21.1</b>	<b>92.4</b>	<b>—</b>
Women and children ..	170	2	—	2	11.7	—	11.7	—
<b>1924.</b>								
A. and S.H. .. ..	670	1	46	47	1.4	68.6	70.1	—
1st Dorsets .. ..	617	12	9	21	19.4	14.5	34.0	—
42nd Coy. R.E... ..	150	1	9	10	6.6	60.0	66.6	—
Other units .. ..	Variable	—	2	2	—	—	—	—
<b>Totals { Officers and other ranks</b>	<b>1,049</b>	<b>14</b>	<b>66</b>	<b>80</b>	<b>13.3</b>	<b>62.9</b>	<b>76.2</b>	<b>—</b>
Women and children ..	176	2	4	6	11.3	22.7	34.0	—
<b>1925.</b>								
1st Leicesters .. ..	551	4	5	9	7.2	9.0	16.3	—
R.I. Fusiliers .. ..	723	8	—	8	11.0	—	11.0	—
1st Norfolks .. ..	700	6	—	6	8.5	—	8.5	—
42nd Coy. R.E... ..	135	4	—	4	29.6	—	29.6	—
Other units .. ..	Variable	—	2	2	—	—	—	—
<b>Totals { Officers and other ranks</b>	<b>1,592</b>	<b>22</b>	<b>7</b>	<b>29</b>	<b>13.8</b>	<b>4.3</b>	<b>18.2</b>	<b>—</b>
Women and children ..	263	3	—	3	11.4	—	11.4	—
<b>1926.</b>								
1st Norfolks .. ..	790	2	—	2	2.5	—	2.5	1st Norfolks left the Station 28.9.26, nine months of 1926 in the Station
2nd Royal Scots .. ..	736	11	3	14	14.9	4.0	18.9	—
1st Somerset L.I. ..	525	—	—	—	—	—	—	1st Somerset L.I. arrived 28.9.26
42nd Coy. R.E. .. ..	149	4	1	5	26.8	6.6	33.4	—
Other units .. ..	Variable	2	—	2	—	—	—	—
<b>Totals { Officers and other ranks</b>	<b>1,704</b>	<b>19</b>	<b>4</b>	<b>23</b>	<b>11.1</b>	<b>2.3</b>	<b>13.4</b>	<b>—</b>
Women and children ..	247	—	—	—	—	—	—	—

*N.B.*—As some units did not complete a year in the Station, the unit strengths are the sums of the average monthly strengths divided by the number of months in the Station. The total strength is the sum of the total monthly strengths from Army Form A 31, divided by 12.



treatment of infected cases is far more important than trying to exterminate the carrier—an impossible task.

(3) That a regiment with a previous antimalaria history should not be a source of danger, provided strict supervision is maintained.

(4) Prophylactic quinine is of great benefit when the source of infection is definitely traceable and when it can be given to those persons who are known to be exposed to this source and at appropriate times with reference to their exposure, e.g., in Moascar to the men employed on night guards in the vicinity of infected villages.

(5) That the most carefully planned antimalaria measures may be entirely annulled by slackness or failure of a unit to carry them out. Co-operation in all units is essential.

My acknowledgments are due to Lieutenant-Colonel R. B. Ainsworth, D.S.O., A.D.H., Egypt, for valuable advice and suggestions.

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## DENTAL FIRST-AID FOR MEDICAL OFFICERS.

BY CAPTAIN S. H. WOODS.  
*The Army Dental Corps.*

AT stations where there is no dental officer in constant attendance on the troops, the medical officer is frequently called upon to relieve painful dental conditions. These pages are prepared in the hope they may be of some assistance to medical officers so situated. The dental conditions for which the soldier seeks relief will be outlined and appropriate first-aid indicated for each case. It must be understood that the treatment suggested is purely of an emergency nature and that the soldier should subsequently be referred to the dental officer as soon as he is available.

The dental conditions for which the soldier reports for relief may be tabulated thus :—

- (1) Pain in a tooth with a cavity.
- (2) Pain in a tooth following injury.
- (3) Pain in a tooth due to exposure of cementum.
- (4) Painful gums.
- (5) Pain due to misplaced lower third molars.
- (6) Fractures of the jaws.
- (7) Post-extraction hæmorrhage.

### EQUIPMENT.

The medical officer is usually handicapped by the lack of a comprehensive dental first-aid equipment. The pouch supplied contains a number of forceps, a probe, a dental mirror and pair of dressing tweezers.

The following drugs should be obtained from the dispensary in small quantities in well-stoppered bottles :—

Liquids	Powders	Mixture
Oil of cloves	Zinc oxide	"Carbolized resin" made thus :—
Oil of turpentine	Silver nitrate	Resin .. .. 4 parts
Carbolic acid (pure)	Alum	Carbolic acid (pure) 4 parts
Chromic acid (1 in 5)		Chloroform.. .. 3 parts
Acrosyl (pure)		Dissolve and filter.

An ear syringe will serve as a water syringe, and a penknife and the side of a flat eight-ounce bottle as spatula and slab.

As an antiseptic solution for instruments, one per cent acrosyl is best. As a general mouthwash, this one per cent solution diluted with two parts of hot water is much superior to and more economical than those usually prescribed.

### (1) TOOTH WITH CAVITY.

Such painful teeth are divisible into two groups with different signs and symptoms, and it is essential to distinguish between them :—

*Differential Diagnosis.*

<i>Group I</i>			<i>Group II</i>
Is within the tooth, i.e., inflammation of pulp		Cause of pain	Is outside the tooth, i.e., inflammation of periodontal membrane
Sharp, throbbing, intermittent, worse in recumbent position, frequently referred		Nature of pain	Dull, heavy, constant and localized to tooth
Causes no pain.. ..		Tapping or biting on tooth	Causes pain
Cause pain, especially if thermal changes are extreme		Hot and cold foods	Cause no pain
None .. ..		Local gum reaction	Usually some degree of swelling, varying from a small gumboil to extensive and obvious swelling of neighbouring tissues

*Treatment.—Group I.*

*Sedative dressing*, applied thus :—

Prepare a few small pledgets of wool approximately the size of the cavity and a few larger rolls about the size of an olive.

Syringe the cavity, to remove all debris, by gentle squirts of water at body temperature.

If *upper* tooth, place a roll between cheek and tooth to keep off saliva.

If *lower left* tooth, place a roll on the cheek and tongue sides of the tooth and let the soldier keep them in place with left little finger and right forefinger respectively. This also serves to give a good view of the cavity as the cheek is drawn aside and the tongue is depressed.

If *lower right* tooth, he should use the right little finger and left forefinger.

Dry the cavity with one or more pledgets, using no pressure.

Dip a pledget in oil of cloves, shake off excess and gently insert in the cavity.

Place one drop of carbolized resin in the centre of the flat side of an eight-ounce bottle and near it a tiny heap of zinc oxide powder. Mix small quantities of the powder with the liquid until a very stiff paste is obtained.

Take a few wisps of cotton-wool, incorporate them in the paste, and make a small ball to fit the cavity.

Smear the tips of the tweezers with vaseline to prevent adherence of the dressing, remove the cloves pledget, and place the dressing in the cavity. Pack gently into place with another pledget dipped in water, let the patient close his teeth together and note that the dressing is clear of the opposing teeth, for, if too much is inserted, pressure within the cavity will increase the pain.

This dressing sets rapidly under saliva, is impervious, adapts itself to the shape of the cavity, is very adhesive and can be left for several days provided the tooth responds satisfactorily.

Carbolized resin is sticky and somewhat messy to work with. Tweezers, knife and bottle should be wiped immediately after use to remove as much residue as possible and the remainder scraped off when dry.

In hot climates the chloroform tends to evaporate and the mixture becomes hard. A few drops of chloroform should be added occasionally to counteract this.

When this treatment fails to relieve the pain the tooth should be extracted.

As an emergency dressing for a few hours only, for example when a soldier reports at night with toothache (Group I) and will be seen by the dental officer in the morning, a pledget saturated with carbolyzed resin and left in the cavity generally suffices.

#### *Treatment.—Group II.*

In cases where the symptoms are severe and show no signs of abatement, and when a dental surgeon will not be available for several days, extraction is indicated.

As a general rule the dental surgeon would attempt to conserve useful single-rooted teeth thus affected as they can frequently be dressed and treated. A medical officer should use particular discretion in these cases.

When immediate extraction has been decided upon and there is difficulty in opening the mouth (trismus), treat thus:—

- (a) Pass the mirror backwards between cheek and tooth to expose the gum.
- (b) Make a deep incision, directed towards the bone, as near as possible to apex of the affected tooth or where the abscess appears to be pointing.
- (c) Pass a blunt probe through incision towards the apex and attempt to reach pus.
- (d) Let patient hold very hot water in the mouth frequently, keeping each mouthful for at least two minutes.

By such means sufficient opening for extraction can generally be obtained.

When trismus does not answer to this treatment, the case must be considered as urgent and should be transferred to the nearest dental centre or hospital without delay.

*External fomentations should never be applied.*—It is essential to emphasize this point, as serious consequences may follow.

#### (2) PAIN DUE TO INJURY.

The injury may or may not fracture the crown.

##### *A.—When the Crown is not Fractured.*

(1) When the tooth is slightly or moderately loose, isolate with rolls as described above, apply daily liquor iod. fortis as a counter-irritant to the gum, advise mastication on the opposite side and note progress. If unfavourable, extract the tooth.

(2) When the tooth is very loose and tender, extract it at once.

##### *B.—When the Crown is Fractured.*

(1) *When the pulp is not involved* the pain is due to exposed dentine, the nerve fibrils of which respond to thermal changes and irritating foods. Take a sewing needle, hold the eye-end in a spirit flame till red hot and dip in the silver nitrate powder. A small quantity will adhere loosely, which should be firmly fused on by holding it above the flame for a second or two to melt it and then allowed to cool as a firm bead on the end. Isolate the tooth with rolls as already described, moisten the fractured surface with a small drop of warm water and gently rub the bead over it till a milky solution is obtained. Allow light to fall on the tooth for one minute, remove rolls and let the soldier rinse with warm water. Repeat daily for two or three days and note progress. If no improvement, extract the tooth.

(2) *When the pulp is involved* extraction is usually indicated. When this is not possible at the moment, owing to other injuries, treat thus: Isolate the tooth with rolls, saturate a tiny wool pledget with pure carbolic acid and touch the dentine, allowing the drug to pass over the pulp and thereby avoiding direct pressure on it. Leave for half a minute, dry gently, dip a pledget in carbolized resin and touch the broken surface. Allow to dry before removing rolls. Upper incisors and canines should be retained in healthy mouths when the pain is not very severe and a dental surgeon will be available at an early date.

In *vertical fractures* the fragments are sometimes held together at the neck by the periodontal membrane and the fracture may not be obvious at first sight. Such a condition is generally found in upper bicusps following excessive masticating strain on these teeth which were previously carious, or due to a fall or blow on the chin in which the mandibular teeth are driven with great force against the maxillary teeth.

By pressing the cusps outwards, the fracture is exposed. In such a case the semi-detached fragments should be firmly grasped vertically by a strong pair of tweezers and sharply twisted off, when the tooth can be dealt with as described above.

### (3) PAIN DUE TO EXPOSED CEMENTUM.

Normally the gum at the neck of a tooth covers the junction of the enamel of the crown with the cementum of the root. Any shrinkage of this protecting gum exposes the cementum, which reacts to thermal changes and irritating food juices.

*The symptoms* are pain in the affected tooth on drawing air through the mouth, when brushing the tooth, and when taking very hot or cold food and sweet or bitter things.

The exposed cementum generally presents a smooth, shiny, yellow surface between the enamel and gum margins at the neck of the tooth.

*Causes of the Gum Shrinkage* :—

- (a) Excessive friction with the toothbrush, especially when used horizontally.

- (b) Abrasive powders and pastes.
- (c) Acid oral secretion, particularly during acute fevers.
- (d) Bands of dentures.

*Treatment.*—Cauterize the exposed cementum with a bead of silver nitrate, as described under (2) B. Usually two or three applications at intervals of three days are necessary. In addition, when several teeth are involved, as after fevers, the teeth should be brushed with sodium bicarbonate, twenty grains to the ounce, the last thing at night, and the mouth *not* rinsed afterwards.

#### (4) PAINFUL GUMS.

The commonest and most important gum condition for which the soldier seeks relief is acute ulcerative gingivitis, the symptoms and treatment of which I described in detail in the October, 1926, issue of this Journal.<sup>1</sup>

For other conditions the gums should be brushed daily with alum, ten grains to the ounce, pending treatment by the dental officer. The soldier sometimes reports for sore gums when the condition is really single or multiple dyspeptic ulceration at the reflection of gum and cheek. The small ulcers should be cauterized with silver nitrate and a purge administered.

#### (5) MISPLACED LOWER THIRD MOLARS.

These teeth give rise to the following sequence of conditions, in any stage of which the soldier may report for relief:—

- (1) *Pain*—(a) in gum over tooth, worse on eating; (b) in second molar, due to pressure on its roots; (c) neuralgic, specially in ear, due to common origin of auriculo-temporal and inferior dental nerves.
- (2) *Swelling* of gum over tooth, leading to
- (3) *Ulceration* of gum over tooth, great tenderness on eating, followed by
- (4) *Suppuration* in tissues round teeth, producing swelling of face, neck, angle of jaw, fauces and pharynx, and cervical lymphatic glands.
- (5) *Trismus*, generally severe.

#### *Treatment.*

*When the Condition is (1), (2) or (3).*—Make a crucial incision over the erupting tooth, pushing the blade down till the crown of the hidden tooth is felt. Frequent mouthwash of *hot* water, each mouthful kept for two minutes. Liquid or soft diet; purge, and aspirin, specially before sleep. If, by the following day, the condition has not improved and there is no possibility of early treatment by dental officer, either extract the second molar before trismus begins or transfer to hospital at once.

*When the Condition is (4) or (5).*—The case must be sent to the nearest

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<sup>1</sup> "Post-war Acute Ulcerative Gingivitis."



hospital or dental centre without delay. When some time must elapse before this can be arranged, or when the journey is long, make incision, pass probe and prescribe hot water as for alveolar abscess.

#### (6) FRACTURES OF JAWS.

*Sites: Mandible.*—Anywhere, but commonly: (a) At angle; (b) in molar region; (c) in canine region.

*Maxilla.*—Generally alveolar portion, and specially of front teeth.

*Symptoms and Signs.*—(a) Pain in region of fracture, increased by movement; (b) loss of power; (c) deformity in line of teeth; (d) swelling; (e) mobility of fragments.

*Treatment.*—*Emergency*, pending transfer to hospital or dental centre as soon as possible:—

The medical officer should be more concerned with the control of oral sepsis than with the resting of the fragments. As most of the fractures are at, or near, the angle of the jaw, with much displacement, the four-tailed bandage gives very little support at best, and may cause much pain when the lips and cheeks are badly bruised. If left on for two or three days without removal, the mouth becomes very foul and sepsis considerably retards the subsequent treatment. The soldier should take small mouthfuls of hot acrosyl (1 in 300), or hydrogen peroxide (two vols.), and retain each mouthful for two minutes. This should be done frequently, particularly after meals, which are of necessity sloppy, leaving much residue round the teeth.

If the soldier is being transferred the same day, give aspirin ten grains, and apply the four-tailed bandage just before departure.

If the soldier is detained overnight, apply the bandage at night, remove in the morning, and repeat mouthwashes during the day.

#### (7) POST-EXTRACTION HÆMORRHAGE.

##### *Varieties.*

(1) *Primary*—immediately after extraction.

(2) *Recurrent*—some hours after extraction.

##### (1) *Primary.*

Usually ceases in a few minutes, specially if cold water is used for rinsing, but is often sharp and somewhat prolonged on extraction of a tooth chronically inflamed, owing to degeneration of vessels. When it persists apply pressure and styptics, thus:—

(a) Place the finger and thumb on either side of the socket and exert firm inward pressure on the alveolus, the sharp edges of which are frequently responsible by cutting into vessel walls.

(b) Prepare pledgets of wool about the same size as the tooth extracted, syringe socket with cold water and rapidly insert a pledget moistened in adrenalin (1 in 1,000), or moistened in water and dipped in pure tannic acid.

(c) Force pledget well home with the flat end of a pencil, cover

with another pledget and let the soldier bite firmly on this, keeping up the pressure for ten to fifteen minutes.

- (d) Remove top pledget and note whether bleeding has ceased or whether it continues on removal of pressure. If it has ceased, carefully remove pledget from socket, let the soldier sit upright and still for a few minutes, and when clot has consolidated, dismiss.
- (e) If it continues, replug, keeping up pressure for a longer period, and examine as above. If not successful, treat as under for recurrent type.

(2) *Recurrent.*

*Treatment.*—(a) Clear mouth of clots by entangling them on dry wool rolls; (b) syringe socket with cold water; (c) note whether bleeding from :—

- (1) Gums or
- (2) Socket.

(1) *Gums* :—

If capillary oozing, insert pledget soaked in styptic, cover bleeding gums with lint soaked in styptic and apply firm pressure with finger and thumb, or let patient bite on lint.

If arterial bleeding, endeavour to locate the vessel and twist with artery forceps, and exert pressure at bleeding site.

(2) *Socket* :—

Plug tightly with a pledget saturated in oil of turpentine. Cover with a small roll of lint or gauze, let the patient bite firmly and apply a four-tailed bandage sufficiently tight to exert continuous pressure.

Leave till the following morning and give the soldier the following directions: Avoid all stimulants, hot drinks, and all excitement. During day remain sitting with body erect; night, recline with head raised. In morning, remove plug if bleeding has stopped and treat socket by syringing daily till closed.

This treatment will generally be successful, and oil of turpentine should be used for plugging sockets in preference to any other drug. It is a powerful styptic and antiseptic, and leaves a much healthier looking socket than other styptics commonly used.

Hæmophilia is such a rare condition in the Army that it need not be discussed here. I have only seen one case in eight years which could be likened to this condition, and continuous pressure as just described sufficed to control it in the end, though hæmorrhage persisted five days.

The importance of calcium lactate has been somewhat exaggerated, as recent investigation has shown there is no lack of calcium salts in cases of non-clotting, but a defect in the process of fibrin formation. In all cases where the blood shows defective clotting hæmoplastin, if available, should be applied to the socket, and in prolonged hæmorrhage one to two cubic centimetres should be injected intravenously or subcutaneously, and repeated every four to six hours until the condition is controlled.

## QUININE.

By QUARTERMASTER-SERJEANT ERIC F. SMITH.  
*Royal Army Medical Corps.*

THE daily dose of quinine is familiar to many of us on duty in tropical climates, but few realize the fascinating and romantic history of quinine and its relation to cinchona.

Quinine itself is an alkaloidal product from the bark of the cinchona tree, and was first isolated in the year 1849 by the French chemists, Pelletier and Caventon, and for their labours they were awarded 10,000 francs by the French Government.

As early as 1746 French chemists were endeavouring to obtain a crystalline substance from cinchona bark with a view to its employment in the treatment of fevers. In 1792, one Fourcroy, at Paris, obtained slight results, but he lived in troublous times and was not able to pursue his investigations. He did, however, place on record a prophecy which was remarkably true. "These researches," he wrote, "will no doubt lead to the discovery one day of an anti-periodic febrifuge, which once known may be extracted from various plants."

The cinchona tree is a native of Peru. It takes its name from Countess Ann of Chinchon, wife of the Spanish Viceroy of Peru, who, so far back as 1638, was cured of a fever, probably malaria, after taking an infusion of the bark. So enthusiastic was this lady over her cure that, on her return to Spain in 1640, she recommended it to her friends for divers ills, and did her best to popularize the bark. Its use medicinally was probably known to the Peruvians years before the Countess was cured of her malady, and the story runs that its efficacy was first discovered as the result of an earthquake which caused a number of cinchona trees to fall into a lake. A native, suffering from the violent thirst consequent on a high fever, drank of the waters of this lake and found himself shortly afterwards cured of his ailment. In consequence this lake near Loxa was for a time credited with miraculous healing properties, until the reasons for its curative powers were discovered. Charles Lamb's history of the origin of roast pork is almost a parallel, although in this instance earthquakes could not be made to order like the Chinaman's houses on fire.

The Count and Countess of Chinchon brought with them, on their return to Spain, their personal physician, one Juan del Vego, who afterwards took up his residence at Seville, and having obtained a considerable quantity of the bark, sold it as a secret remedy at one hundred reals per pound. The silver real being worth about eightpence in our money, the wily physician must have netted a handsome fortune. His success created

a considerable amount of jealousy and controversy until the remedy remained no longer a secret.

It is more than probable that the Jesuit Missionary Fathers in Peru knew of the virtues of this bark before the Countess had them introduced to her. They attempted to keep their knowledge a secret, and some of them, on their return to Europe, introduced the powdered bark to the Jesuit College at Rome, and explained its use in the treatment of fevers and agues, with a view to profiting the coffers of Mother Church. The Procurator General of the Order, afterwards Cardinal de Lugo, on a visit to Paris in 1649, cured Louis XIV of a fever after administering the powdered bark. This royal cure was a gigantic advertisement, and the Jesuit fathers, anxious to propitiate "*le grand monarque*," took care that they themselves obtained all the credit for the discovery of the remedy. It ultimately became known as Jesuit's bark or Cardinal's powder, and was in great demand, but could only be obtained through the medium of the followers of Ignatius Loyola. So popular, indeed, did it become, that imitations, containing no cinchona but possessing the necessary appearance and taste, were made up by unscrupulous physicians. The necessary bitter taste was simulated by the addition of aloes. These concoctions were advertised by the then known mediums of advertisement, and it is clear that "cure alls" and secret remedy merchants are not modern innovations. They certainly lacked the press columns, with publication of "unsolicited" testimonials, but dupes were to be had for the asking, then as now. Strange to say, the very title, "Jesuit's Bark," drove cinchona out of fashion. Early in 1700 there was an outcry against the Order, and its enemies made it easy to turn the masses against any cures for which the members of the Order had made themselves responsible.

It was left to an Englishman to bring finally to the fore the value of cinchona as a specific for agues. Robert Talbor, an apothecary's assistant at Cambridge, was a student at the University in 1663. He has been accused of many acts of roguery, but seems to have been possessed of a high degree of intelligence, and had what we should call a good "bedside manner."

He wrote a book on the cure and cause of agues, and prescribed therein numerous secret remedies of his own, but amongst other things he brought to notice the therapeutic value of Peruvian bark (the name he adopted for cinchona). He cured the daughter of Lady Mordaunt, and Charles II himself, when those personages were stricken with fever. The "merry monarch," always prolific with his honours, knighted Talbor, appointed him one of his physicians and gave him a salary of £100 per annum. Charles so far interested himself in his new doctor that Talbor persuaded him to write to the College of Physicians, ordering that august body to refrain from interfering with Talbor's practice. What the present Royal College of Physicians would have said to such a royal command can only be left to the imagination. The next we hear of this persuasive medico is

in Paris, where he quickly attained popularity, and came under the notice of Madame de Sévigné, whose letters are world-famous. In one of these epistles she writes (in 1680): "The Englishman has promised on his head to cure Monseigneur (the Dauphin) in four days. If he fails I believe that he will be thrown out of the window." Talbor did cure his illustrious patient, and woman-like, Madame chronicles with malicious joy the embarrassment of Antoin d'Aquin, Louis XIV's head physician.

D'Aquin, to justify his existence and professional ability, published an angry attack on his English confrère, and said amongst other things that in curing the Dauphin of one disorder Talbor gave him a worse complaint. Talbor obtained 2,000 guineas from his royal patron, and a pension of £100 for the prescription, which, when published after his death at the age of 41, in 1681, gave the composition as follows: Infusion of rose leaves, and parsley in water, with lemon juice, added to which was a strong infusion of Peruvian (cinchona) bark. Talbor's detractors said that opium was another ingredient, but as Wootton, in his "Chronicles of Pharmacy" adds, "if he did he invented a valuable combination."

In the British Museum Library there is an interesting collection of quack advertisements, dated 1675 *et seq.* Amongst these pamphlets is one issued by a Dr. Charles Goodall, "at the Coach and Horses, near Physician's Colledge, Warwick Lane." He advertises "for the public good a very superior sort of Jesuit's Bark ready powdered and papered into doses" at 4s. the ounce.

Nearly all the quinine used by the world nowadays is obtained from cinchona trees grown in Dutch Java. The trees are tended scientifically with the object of producing bark rich in quinine, the most important of the many chemical substances found in the bark.

Cinchona flourishes well in India, but little of the world's supplies of quinine are now obtained from that continent, and it is to be deplored that in the country where quinine is in such great demand greater efforts are not made to cultivate it extensively and so capture the world's market.

The tree was first introduced in India for cultivation through the efforts of Sir Clements Markham, the famous explorer, and one time President of the Royal Geographical Society. Markham tried to insist on the adoption of the name "chinchona" instead of "cinchona," in justice to the name of the lady who first introduced the bark into Europe. He writes of the Countess as "one of the most noble benefactors of the human race," somewhat extravagant praise which calls to mind De Quincey's "unconscious minister of divine pleasures" regarding the chemist who first sold him opium.

In 1859, Markham was commissioned by the Indian Government to proceed to South America to obtain seeds for the cultivation of the tree in India, but lack of enthusiasm on the part of the authorities, and their parsimony in meeting the expenses of the pioneers, all but wrecked a scheme which might have been of great advantage to the Empire, both

humanely and financially. Markham himself gave his whole time and efforts in an attempt to bring to the notice of the authorities the value of the cinchona cultivation in India, and he was so far successful in planting the first trees in that country.

His coadjutors, some of whom were crippled in health as a result of their labours in a fever-ridden country, received a mere pittance, and barely a recognition. After Markham, the world is indebted to Charles Ledger for the finest cinchona seed. Ledger was employed from 1841 to 1858 by the New South Wales Government in South America buying alpacas. During his travels a Spanish-American servant, Manuel Manami, introduced to him some seed of excellent strain. Ledger sent these seeds to his brother in England with the intention of offering them to the British Government for trial in India. After months of negotiations the offer was refused, and the Dutch Government on being approached bought them for £33, thus laying the foundation of the present large cinchona cultivation areas in their Java possessions, and incidentally depriving the British market of a valuable commodity. Ledger has been called the "Cinchona Pioneer," and the trees which yield the majority of the world's supplies are named after him (*Cinchona Ledgeriana*). The Dutch were so pleased with the results that they paid Ledger the sum of £100 for his efforts. The "Ledger" cinchona was introduced into India, and produced such excellent results that Markham himself, always an unselfish investigator, requested the authorities to make some substantial mark of recognition to the man who had done so much towards obtaining the perfected tree. The Government, however, refused to untie its purse strings, and Ledger was too modest to bring himself to the fore.

Professor H. G. Greenish, Dean of the School of Pharmacy, in an interview reported by the *Indian and Eastern Druggist*, stated that he remembered well "the day when cinchona was sent in such quantities to London that at the London Docks there used to be special floors devoted entirely to the reception of cinchona bark, the major share of which came from India. At the present time comparatively small quantities of cinchona are introduced in London, and most of the bark that does reach the Thames comes from South America or Dutch Java, India's quota having entirely disappeared."

The *Pharmaceutical Journal*, in 1923, gives the statistics of production of cinchona bark as summarized in the "Bulletin of the Imperial Institute" as follows: "Java, 228,880,000 pounds; India, 2,000,000 pounds; other countries, 440,000 pounds."

Before the Great War the Amani Institute, in German East Africa, specialized in the cultivation of chincona trees for quinine production. During the war the Amani Institute passed into British hands. A recent analysis of the Amani bark proved that it contained nearly twice as much quinine as the Dutch "Ledger" bark. The future of the Amani cultivation is watched with interest, and it would seem that the seeds from Africa



could be introduced into India, and an attempt made to recapture the world's quinine trade for the Empire which uses most of this valuable medicine.

The value of quinine as a specific for malaria was summed up in the "Medical History of the War," vol. ii, p. 217, etc., as follows:—

"In spite of much and varied experimentation, no drug has been found to have any specific action on malaria except quinine. No method of administration, other than the long-recognized oral exhibition of the drug, has been proved to be of superior value in the routine treatment of malaria. . . . The early or immediate and prompt treatment of malaria by quinine in doses of ten grains three times a day quickly cures the disease in a large proportion of the cases." The tincture cinchona co. of the B.P. (sometimes called Huxham's tincture of bark) was originally prescribed by Dr. John Huxham, and published as a specific in his "Essay on Fevers," in the year 1785. Huxham was considered to be rather a prosy prescriber, even by his contemporaries in a day when it was believed that the more complicated a prescription the better the results. One of Huxham's published prescriptions contained more than 400 ingredients. Fortunately for Part B Dispensers, this prescription has no place in the B.P. and Whittle is silent regarding it.

Huxham's original prescription for tinct. cinchona co. should be interesting to both Part A and B candidates:—

Cort. peruv. opt. pulv.	..	..	..	2 oz.
Flor. aurant. hispan.	..	..	..	1 „
Rad. serpent. virgin.	..	..	..	3 „
Croci anglic.	..	..	..	4 sc.
Coccinel	..	..	..	2 „
Vini gallici	..	..	..	20 oz.

F. Infusio clausa per dies aliquot (tres saltem quatuorve).

## Editorial.

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### DIET AND CANCER.

ARTICLES of diet have been suggested from time to time as possible causes of cancer, but up to the present there has been little scientific evidence adduced in support of the idea that food is really an ætiological factor. During recent years we have learnt something of the effect of dietaries on nutrition in general and in particular on specific morbid conditions, but have received no evidence of a direct connexion between diet and cancer, even cancer of the gastro-intestinal system.

In view of these general considerations the Departmental Committee of the Ministry of Health which was appointed in 1923 to consider the available information with respect to the causation, prevalence and treatment of cancer, thought it well to undertake an investigation into the question whether an enclosed community subjected to certain dietetic restrictions had as compared with the general public a reduced mortality from cancer.

Drs. Monckton Copeman and Major Greenwood, to whom the inquiry was entrusted, have just issued their report on diet and cancer with special reference to the incidence of cancer upon members of certain religious orders. In the introduction the authors state that certain English medical men of repute have suggested that rich abundant food, especially meat, contributes to the production of cancer, that intestinal stasis conditioned by the diet of civilized mankind is the most important ætiological factor of malignant disease, and that the use of preservatives in the food industries has a bearing upon the increase of mortality from cancer.

Hindhede called attention to the increase of mortality in Denmark associated with an increasingly rich diet and the temporary arrest of the disease under the dietetic restrictions of war, and Monckton Copeman reported a similar correlation in English war time experience.

The alleged low incidence of mortality from cancer upon primitive people has been supposed to be due to peculiarities of diet. According to Williams cancer is never found among the black races in Egypt who live on a vegetable diet, but is common among Arabs and Copts who live and eat after the manner of Europeans.

Drs. Copeman and Greenwood state that the objection in principle to most of the arguments used by various writers is the assumption that a correlation in time and space between cancer mortality and some other variable is equivalent to a causal relation, provided such an assumption is not patently absurd.

In 1912, Rollo Russell gave statistics of a number of Cistercian and

Benedictine Monasteries. He pointed out that among 420 votaries in seven monasteries during a period of twenty-six years there was only one death from cancer and that was apparently due to the exceptional habitual use of a strong irritant (pepper). Estimating the average age at 45 and considering that a large number of the residents were over 50 or 60 the cancer deaths corresponding to the average rate among the general population during the last twenty years would have been, reckoning at the rate of only 1 in 18, not less than 20.

These observations of Russell were the starting point of the inquiry made by Copeman and Greenwood. They studied the dietetic habits of the various religious orders in England and also visited a few French and Belgian communities. The rule of life in the Carthusians is extremely rigid, and meat (including poultry and game) is forbidden. Fish and eggs are allowed and a certain amount of beer or wine and of butter or margarine, except during long periods of abstinence. Three meals are served daily. Special gardening arrangements are made for the supply, all the year round, of salads which are consumed uncooked and in considerable quantities at the evening meal.

The rule in the Benedictines is less severe; a small amount of meat is allowed at the mid-day meal on three days of the week for about half the year.

The Cistercian Order is the strictest from the dietetic point of view; meat is wholly forbidden and fish and eggs are only allowed on rare occasions.

The members of the Carmelite Order undertake religious duties outside the monastery and their habits of life then conform to those of their hosts. In the monastery meat is forbidden, otherwise the diet is similar to that of secular schools and colleges.

The Dominicans resemble the Carmelites in their dietetic habits, but the rule of abstinence for practically half the year is especially severe.

Drs. Copeman and Greenwood point out that in order to reach a really useful and unprejudiced conclusion as to the relation of diet to cancer in these religious communities, it is necessary to have an accurate record of the ages and lengths of time under observation of the persons whose risk of dying of cancer it is desired to measure, together with the certified causes of death of those who died. This information they were able to obtain with respect to five religious orders in England, through the kindness of the ecclesiastical authorities and the collaboration of the staff of the Registrar-General's office. With the information thus obtained they constructed life tables, employing as standard life tables those of the British offices life annuity experience (1893). Analysis of the figures available for English and Belgian Cistercian monks showed no evidence of immunity from cancer nor evidence of excessive incidence. The proportion of deaths due to cancer among English Cistercian nuns was also quite in agreement

with the experience of all women in England and Wales. The percentage, was, indeed, rather higher than might have been expected but not significantly so. So far as their experience of Cistercian Orders went, there was no evidence of any differentiation. The evidence obtained in relation to the English Carthusian monks indicated a low mortality from all causes and as cancer is an important factor of general mortality Drs. Copeman and Greenwood consider it is arguable that the rate of mortality from cancer must have been low. But there is no evidence of any *specific* advantage in respect of cancer mortality, that this rate of mortality was more affected than the rate from any other cause of death.

As regards English Benedictine nuns the proportional mortality from cancer differs in no significant way from that of the general female population. The figures for the English Carmelite nuns lead to no suggestion of immunity from cancer; of the ten deaths reported two were certified as due to cancer.

From the data analysed, Drs. Copeman and Greenwood infer that no statements as to causes of death, even when made in absolute good faith by persons long resident in the communities, should be accepted without verification. Among the English Carthusians and Cistercians visited by Dr. Copeman *one* death only was known by the authorities to have been due to cancer. Investigation of the death register showed *seven* deaths definitely certified as caused by cancer and four others which might have been due to cancer. What reliance can be placed on hearsay statements respecting mortality from cancer amongst, say aborigines, may be judged in the light of this investigation of well-kept records. Drs. Copeman and Greenwood cannot say that any *prima facie* case can be made out in favour of the proposition that any of the orders are less liable to cancer than their lay contemporaries in this world. There is evidence—not, having regard to the number of data, very strong evidence, but a faint suggestion—that the mortality of male Carthusians is lighter as a whole than that experienced by the general population. But proportionately, this advantage is not greater in respect of cancer than of other causes of death.

The authors realize that their detailed analyses have been restricted to a small absolute population. They say that even the most exact statistical study of an adult population of only 20,000 through a single year of observation (the numerical equivalent of this study) would be a slender basis for scientific argument. They, therefore, attempted to obtain particulars of a larger number of religious houses and they were able to secure information respecting Cistercian communities in all parts of the world. The results of this survey were negative. Cancer does occur as a fatal disease in Cistercian houses everywhere, but whether the real incidence is high or low cannot be learned. The necessary data do not exist.

In the concluding part of their report Drs. Copeman and Greenwood make some observations on the incidence of fatal cancer upon inmates of prisons and mental hospitals who resemble the members of the

religious orders in that they live in institutions and receive a diet less varied and less rich in proteins and fats of animal origin than the general population.

The most valuable analysis of prison data is to be found in the late Charles Goring's monograph on the English convict. Goring found that the rates of mortality at ages of male convicts were, up to the age group 45 to 55, substantially the same as for the general population of males, but that in the later age groups the rate of mortality in convict prisons was less than in the general population of males. He compared the distribution of causes of death within each age group of 3,968 deaths of convicts with the corresponding distribution of all deaths of males during the period 1886-1909, to which his data related. This analysis showed that cancer was less prevalent amongst convicts than in the general male population.

Drs. Copeman and Greenwood after studying Goring's figures agree with him that the fatal incidence of cancer on convicts appears to be lower than on the general population of like age; but as it was impossible to examine the death certificates or to determine the precise exposure to risk, which they were able to do with regard to the religious orders, they give a verdict of not proven. They think, however, that an analysis of the data which have accumulated in the nineteen years which have elapsed since the end of the period covered by Goring's work is worth making and they intend when occasion permits to carry it out.

In the Sixty-fifth Annual Report of the Commissioners in Lunacy and the Tenth Annual Report of the Board of Control, attention is drawn to the fact that the proportional mortality from cancer in the mental hospital population is much less than in the general population. Drs. Copeman and Greenwood point out that as the total rate of mortality is much larger and the risk of mortality from tuberculosis immensely larger than in the general population, this does not necessarily mean that the actual rate of mortality, i.e., the ratio of the number of deaths to the number of years of life exposed to risk, is different in mental hospitals from that characterizing the general population. They find that the age standardized rates of mortality from cancer of inmates of mental hospitals are a little greater than for all males and females, but as the standard of certification in mental hospitals, which often have the means of verification by post-mortem examination, is probably higher than in general practice, there may be no difference at all between the two rates.

In other words, there is no important difference between the rate of cancer mortality upon inmates of mental hospitals and that upon the general population. But the fact that relatively to other causes of death, cancer is less frequent in mental hospitals than outside them, has led some to suggest that there may be special factors militating against the prevalence of cancer. The mortality rate in mental hospitals from general paralysis is greater than, and from tuberculosis almost as great as, the mortality rate from all causes in the general population. These factors must tell heavily

when the method of proportional mortality is used. But it might be urged that since, judged by mortality rates from disease *not* peculiar to the insane, such as tuberculosis, heart disease and pneumonia, the inmates are bad lives, there is at least a relative immunity from cancer which needs explanation. This argument, however, assumes that the fatal incidence of cancer varies with the general resistance of the body. It is not easy to justify this assumption. The analyses made for the Cancer Commission of the League of Nations dealing with the incidence of different forms of cancer in women led to the conclusion that those subdivisions of the country with high (or low) rates of mortality from cancer of the uterus or breast did not, on the average, have high (or low) rates of mortality from other diseases. This argument is, of course, not conclusive, but the authors consider it proper to call attention to the fact that convicts and insanes, while differing widely in respect of general mortality, have this in common that both show an absolutely, or relatively, low rate of mortality from malignant disease.

In the general summary of their report the authors say that their analysis conclusively proves that fatal cases of cancer occur in populations abstaining from flesh foods and lends no support to the contention that among such populations the relative incidence of cancer is low. Although in a sense the results are inconclusive they do not think the labour has been in vain. They consider that a perusal of their report will convince most impartial persons that no scientific value whatever attaches to assertions, supported merely by the vague pseudo-statistical evidence which is customarily cited, regarding the rôles of certain articles of common consumption in the genesis of cancer. There is a too general impression that it is the duty of scientific men, particularly those in the public service, to try out any and every suggestion of the kind. As the present report abundantly proves the trying out of any such suggestion is a most laborious business, not merely for the investigator, but for the persons called upon to supply information. Such a task ought not to be imposed without strong reason.

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## Clinical and other Notes.

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### A CASE OF CONGENITAL MALARIA.

By MAJOR F. M. LIPSCOMB

AND

CAPTAIN R. A. MANSELL.

*Royal Army Medical Corps.*

THOUGH the fact that intra-uterine infection with malaria parasites may occur is well established, the number of cases of congenital malaria hitherto recorded is comparatively small, and the records leave so much unexplained concerning the ætiology of this frequently fatal condition that any additional evidence is worth bringing to notice. For this reason we are recording, in some detail, a case which, in addition to its actual occurrence, presents certain features of interest.

We have been able to trace records of some seventy cases, reported by practitioners in many parts of the world, in which post-natal infection has been excluded; but we have not been fortunate—or probably persistent—enough to find records of such cases from India. In this connexion the concluding words of Buckingham's article [9] are worth quoting, especially in view of the fact, noted below, that the appearance of symptoms due to the infection may be considerably delayed, even though the parasites are demonstrable at the time of birth. The article ends with the following paragraph: "The findings in these two cases, plus those of several other patients under our care, have led the author to believe that it may be possible to demonstrate the parasite in a large series of cases. It is his hope that the reporting of these may stimulate others working in malarial districts to investigate their cases."

One of the most complete accounts of the condition is given by Forbes [5], who also collected much of the bibliography up to the time of his writing in 1923. From this paper, and from a survey of cases reported since then (so far as we have been able to make one), the following points are taken:—

(1) Congenital malaria may be associated with a somewhat high mortality. Of Weselko's [10] fourteen cases, five died within forty-eight hours of birth.

(2) The mother usually has a frank attack of malarial fever during the later months of her pregnancy. In a proportion of instances, however, the disease in the mother has remained latent throughout the whole period of gestation.

(3) The child may yield evidence of infection at the time of birth, but the appearance of symptoms due to this infection may be delayed for as



long as seven weeks. This occurred in the case reported by Forbes. The most striking instance of the early demonstration of the parasites is that noted in Buckingham's paper, in which *Plasmodium malariae* was recovered simultaneously from the mother in labour and from the prolapsed hand of a yet unborn transversely presenting foetus.

(4) Though there appears to be no doubt that the infection is transmitted from the maternal blood to the circulation of the foetus *in utero*, the manner in which the plasmodium passes through the placental filter remains disputed and obscure. Malaria in pregnant women is common; malaria in the new-born infant is comparatively rare. Thibault [13] examined the blood of 246 newly-born infants whose mothers had active malaria, and found that only three of them had parasites in their blood. The same appears to be the general result of Blacklock and Gordon's investigations [4] in Sierra Leone (we have been able to see only a summary of this work, and not the original). Forbes thinks that congenital malaria may depend on some abnormality of gestation or accident of delivery. Nevertheless, in reviewing the cases in which detailed records of pregnancy and parturition are given, we find, in the majority, that these events ran a normal course.

(5) Quinine given to the mother before parturition may not affect the infection of the foetus; nor can such quinine as may be excreted in the milk be relied upon to control the disease in the suckling child. On the other hand, quinine administered to the baby, whether orally or intramuscularly, cuts short the attack of malaria as effectively as it does in the case of an adult, and the drug appears to be well tolerated at this early age.

From this brief summary it will be seen that not only are the factors which determine the transmission of malarial infection from a pregnant woman to her unborn baby as yet unknown, but that many points in the development of the disease also still require elucidation. The delay in the onset of symptoms due to the presence of parasites, demonstrated some weeks previously, may be analogous to the "blood relapses" which have been recorded in carefully observed patients who have been infected with malaria in the treatment of general paralysis. These "blood relapses" may occur without any observable symptomatology.

The case, in detail, is as follows:—

Mrs. D., a two-gravida, arrived in India from the United Kingdom in September, 1925, and went to live in a malarious station in the North-West Frontier Province. During October and November, 1925, she had attacks of "fever" about once a fortnight. Each attack came on with shivering and lasted a few hours; in the intervals she felt fairly well. In November, 1925, her case was diagnosed as malaria by her medical officer, but she did not know whether parasites were found in her blood or not. Her previous pregnancy and labour had been normal, and the child always healthy. The present pregnancy was reckoned from November 23, 1925, so that her

confinement was expected on July 30, 1926. At the beginning of the hot weather of 1926 she went to Murree in the Northern Punjab, and, from then onwards, was attended regularly. The pregnancy appeared to be normal in every respect, and she had no fever or other illness between the last menstrual period and the attack, now to be described, in August, 1926.

August 6: The patient had a slight "go of fever," for which she did not call in medical aid.

August 8: Fever commenced at about 2 p.m., accompanied by a rigor and hot stage (temperature  $101.6^{\circ}$  F.), and followed by sweating. She was admitted to the Murree Nursing Home. There was no sign of the onset of labour, although this was, by calculation, nine days overdue. A blood smear taken at 8 p.m. contained numerous benign tertian parasites.

August 9: Labour began at 1.30 a.m., ran a normal course, and a healthy boy, weighing eight pounds, was born at 3.50 a.m. After parturition the mother's temperature was  $98^{\circ}$  F., and her spleen was not palpable. She was given fifteen grains of quinine daily by the mouth. The placenta was normal in appearance.

August 10: Both mother and baby well.

August 11: Mother well. Baby had a temperature of  $100^{\circ}$  F. for a short time during the previous night and was slightly jaundiced.

August 12: Mother well. Baby's condition satisfactory.

August 13: Baby had a temperature of  $100^{\circ}$  F. during the previous night, accompanied by vomiting and sweating.

August 14: Baby had lost nine ounces in weight; spleen not palpable. No malarial parasites were found in a blood smear.

August 15: Baby vomited once during the previous evening, but had gained two ounces in weight. The jaundice was clearing up. The mother's quinine dosage was discontinued, as it was thought that it might be the cause of the baby's vomiting.

August 19: The progress of both mother and baby was satisfactory, and on the 21st they were discharged from the nursing home.

September 4: The mother reported that she had had an attack of "fever" with shivering six days ago, and that since then the baby had had an attack of fever (temperature  $102^{\circ}$  F.) for a few hours in the early morning on alternate days. She had not worried about this, as he was taking his feeds and otherwise appeared to be doing well. His general condition was good, but examination revealed that the spleen was palpable two centimetres below the costal margin. A blood smear taken at this time contained numerous benign tertian rings and a few gametocytes. Treatment: One and a half grains of the acid hydrochloride of quinine in syrup and water three times a day for a week, and thereafter once a day up to two months.

September 9: Baby doing well. No recurrence of fever. Spleen no longer palpable.

October 4: Baby made excellent progress until four days ago, when he

caught a "cold" from other members of the family. Temperature 99.4° F.; scattered coarse crepitations over both lungs; fine crepitations at the base of the left lung with diminished air entry and impaired resonance on percussion over the same area. The signs of deficient aeration of the base of the left lung, without evidence of pneumonia, suggested that this was an atelectatic condition due to pressure by the previously enlarged spleen.

October 7: Condition improving; no malarial parasites found in a blood smear.

October 11: Practically recovered. No signs in the chest.

October 28: The mother reported by letter from the Plain's station, to which she had returned, that she had had "fever" for one day, but that the baby was very well and had gained twenty-two ounces in weight during the past fortnight.

The blood examinations were made by the thick-drop method.

This case is believed to be a genuine one of intra-uterine malarial infection. It occurred in Murree, in the Northern Punjab, at an altitude of 7,200 feet above sea level, where no malaria has yet been reported to have been contracted, and in a part of the station remote from the probability of the importation of infected anophelines. *Anopheles plumbeus*, var. *barianensis*, is not uncommon in and around Murree; but it has not, so far as we are aware, yet been incriminated as a carrier of the malaria parasite. The remaining mosquito population is believed to be culicine. In the circumstances the possibility of direct inoculation of parasites from the mother into the baby by a biting insect is considered to be so remote as not to be worth discussing.

With regard to the theory that congenital malaria is due to an abnormality of gestation or accident of delivery, there is, in this case, a striking absence of symptoms of any such factor. It is possible, however, that a microscopical examination of the placenta might have yielded valuable information on this point.

The tertian fever with vomiting, from which the baby suffered immediately after birth, was probably malarial. Postulating that the incubation period of the congenital is similar to that of the "natural" form of the disease, this would indicate either a transplacental infection occurring some days prior to the frank attack of malaria in the mother, or that the parasites passed through the placenta during the mother's attack in sufficient numbers to cause immediate symptoms in the child. If the neo-natal fever be accepted as malarial, then the dates of sporulation of the parasites, as evidenced by the occurrence of fever, in the child were in proper sequence with those in the mother. Also, both the mother and the child suffered from a relapse on the same date. This latter may have been mere coincidence, but it raises the very interesting question of the periodicity of malarial relapses.

It is permissible to speculate that, whereas the liability to relapse may, as Yorke [2 and 3] holds, be dependent on no factor other than the

resistance of the individual concerned, the times of incidence of recurring relapses may be concerned with some factor in the life history of the parasite of which we have, as yet, no definite knowledge. It is noted in Manson's "Tropical Diseases" [1], with regard to subtertian malaria, that "there is a great proneness to relapse at more or less definite intervals of eight to fourteen days, but an immunity soon appears to develop." Not a few officers in medical charge of troops in malarious countries must have noticed that fresh infections with malaria often occur in batches. In a certain proportion of these cases the relapsing character of the disease becomes established—whether in spite or because of careful "quininization" remains yet an open question. Then, during the ensuing non-malarial season, a tendency for relapses also to occur in batches may be observed. Such a group of relapses is usually ascribed to some external influence, for example, a thunderstorm, cold weather, extra heavy duties, and so on; but frequently, it must be confessed, without any great conviction. Indeed, when in medical charge of a unit known to contain a large percentage of men who have had active malaria in recent months, it has been an agreeable surprise to find that a heavy march on manœuvres, or a cold, wet spell in camp has not produced the anticipated crop of relapses. Hence, while not denying the importance of outside agencies in influencing the state of resistance of the individual, it is suggested that the factors which determine the *time* of occurrence of a malaria relapse may not relate entirely to the host, but may include a property of definite periodicity of "relapse" inherent in the malaria parasite.

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# *ASCARIS LUMBRICOIDES* IN THE SINGAPORE GARRISON.

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THE almost daily arrival at the laboratory of specimens of *Ascaris lumbricoides* for identification suggested a heavy infestation of the troops of the Singapore garrison. In view of the now well-recognized facts that this nematode is not only a cause of occasional severe illness, but is frequently associated with chronic ill-health, it was decided to undertake the examination and, if necessary, treatment of all troops stationed in Singapore and the surrounding islands.

Arrangements were accordingly made for specimens to be sent to the laboratory from all units and also, as a routine, from all patients admitted to hospital. In the former case the examination was completed for companies before treatment was undertaken. In the latter, however, positive cases were placed under treatment at once. The result of this procedure is shown by a reduction in the percentage of men harbouring *A. lumbricoides* from 79·56 per cent in the first company examined to 65·35 per cent in the last company examined five months later. At the same time, the removal of the main source of infection no doubt also helped towards this result.

The mass treatment of troops in barracks was reflected in the figures for hospital cases, as the following table shows :—

TABLE I.

Investigation commenced		Number of specimens examined	Percentage positive
August, 1925	..	134	66·6
September	..	189	48·5
October	..	80	52·5
November	..	73	23·2
December	..	28	25·0
January, 1926	..	88	17·04
February	..	23	0

These figures include re-examination of cases treated in hospital, but they form only a very small part.

*Procedure.*—About ten to twenty specimens were sent to the laboratory each day in cigarette tins. These specimens were examined by the smear and flotation methods, using a saturated salt solution in the latter case. An effort was made to make the smear preparations more or less constant in thickness, and in reporting results the average number of eggs per field was stated. It was hoped that by doing this it would be possible to ascertain roughly the relation between the number of ova passed and the number of parasites harboured by each individual. This proved to be impracticable, owing to the difficulty of counting the number of specimens per head when treating large numbers of men in barracks. It was noticed, however, that cases which required more than one treatment

showed a reduction in the number of ova per field at each examination after treatment.

The result of the examinations, which are tabulated below, show that in one infantry battalion 84·71 per cent of the men harboured intestinal worms, 74·45 per cent having *A. lumbricoides*, either alone or in company with other worms.

The highest company count recorded was 87·69 per cent and the lowest 74·01 per cent for all worms, and 79·54 per cent, and 65·35 per cent for *A. lumbricoides* alone.

Amongst the remainder of the garrison the counts were not so high.

TABLE II.—INCIDENCE OF *A. lumbricoides* INFESTATION BY STATIONS.

Station	Unit	Number of specimens examined	Percentage positive for <i>A. lumbricoides</i>	Percentage positive for all worms
Tanglin .. ..	British Infantry	770	74·45	84·71
" .. ..	R.A.M.C.	15	6·66	20·00
Fort Canning ..	Details	27	18·51	33·33
Pulau Brani ..	"	60	10·00	16·66
Blakan Mati } ..	British	139	31·53	38·16
	Indian	105	6·66	12·38
<i>Women.</i>				
Tanglin .. ..	—	14	50·00	57·15
<i>Children.</i>				
Tanglin .. ..	—	44	59·09	63·63

Appended below is a list of the parasites which were found during the course of the investigation. In reading this it must be remembered that ascaris was the main object of our search, and that protozoa were only looked for when indicated.

The hospital figures include a small number of re-examinations after treatment in hospital, and also men who had received treatment in barracks.

TABLE III.

Parasites	Hospital cases	Out-patients
<i>A. lumbricoides</i> alone .. ..	194	334
<i>A. lumbricoides</i> , <i>T. trichiura</i> .. ..	69	282
<i>A. lumbricoides</i> , <i>T. trichiura</i> , <i>A. duodenale</i> .. ..	1	1
<i>A. lumbricoides</i> , <i>Strongyloides</i> larvæ .. ..	1	—
<i>A. lumbricoides</i> , <i>A. duodenale</i> .. ..	1	—
<i>A. lumbricoides</i> , <i>O. vermicularis</i> .. ..	1	—
<i>A. lumbricoides</i> , <i>T. trichiura</i> , <i>O. vermicularis</i> .. ..	—	3
<i>A. duodenale</i> .. ..	4	—
<i>A. duodenale</i> , <i>T. trichiura</i> .. ..	1	—
<i>T. trichiura</i> .. ..	84	69
<i>T. trichiura</i> , <i>Strongyloides</i> larvæ .. ..	1	—
<i>O. vermicularis</i> .. ..	1	3
<i>E. coli</i> .. ..	2	—
<i>E. histolytica</i> .. ..	6	—
<i>Trichomonas</i> .. ..	1	1
<i>Tricercomonas</i> .. ..	1	—

*Treatment.*—As stated above, this was carried out in barracks by companies. The men were struck off all duty on the day of treatment and the following day. The second day's "excused duty" was not, in actual practice, a necessity on medical grounds, as little or no inconvenience was caused by the treatment.

The following procedure was adopted and gave good results :—

Day prior to treatment—6 p.m.	..	Pill No. 13 (or similar pills), 2
Day of treatment—6 a.m.	..	Cup of tea
7 a.m.	..	Ol. chenopodium, 10 minims
9 a.m.	..	" "
11 a.m.	..	" "
1 p.m.	..	Mag. sulph., 1 dram "
3 p.m.	..	Dinner

No solid food was allowed before or during treatment, and the consumption of water was curtailed as much as possible. Milk was available if required, and was issued at 10 a.m. and noon.

The oil of chenopodium was given in gelatine capsules, and doses up to 15 minims were given on occasions without any apparent ill effect. The administration of ol. chenopodium 10 minims, in an emulsion with aq. menth pip. 1 ounce, was tried in some of the cases treated in hospital, but did not seem to give such good results as in capsules. The immediate effect of treatment was all that could be desired; practically all the men treated were able to produce numerous worms for inspection the following morning. The largest number produced by any one man was thirty-seven, and he was quite certain that he had not collected them all; however, as he was doing his full duty and apparently in perfect health, his was no mean effort!

It was found during the treatment of the hospital cases that one treatment was not, as a rule, sufficient to clear out all the worms. A second treatment was therefore given to all men about one month after their first treatment.

Perusal of Table I shows that treatment in barracks was largely successful in ridding the men of their parasites.

*Causation.*—(1) As soon as the high infection-rate was realized a search was made for the cause, and the *main* cause was not far to seek.

The troops had, as part of their diet, almost every day uncooked vegetables, principally lettuce and spring onions. In addition to this a certain amount of re-infection, no doubt, took place, particularly amongst the children, but as flies and dust are unusual in Singapore, the main source of infection must have been the vegetables.

When one realizes how these vegetables are grown the figures are not surprising. The main supply of fresh vegetables is from local market gardens, which are owned and managed by Chinese. These Chinese use as manure human and pig night-soil, which has been kept in barrels for about three weeks to "ripen." In addition to this it is a common practice to spray the lettuce with this liquefied fæces, to keep it fresh while it is being conveyed to market.

Both these practices are forbidden by law, but even so it is a very difficult matter to stop them.

The storage of the fæces for three weeks is of very great interest, for two reasons: (1) The fact that other more delicate ova and cysts are probably unable to survive. (2) It gives the ascaris ova time to become mature.



In connexion with this outbreak it is interesting to see almost similar conditions mentioned in the Ministry of Health Report, No. 37, on *A. lumbricoides*.

The figures for ascaris all over Malaya are very high, and the results of eating uncooked vegetables are well shown in the foregoing investigation.

During the course of the investigation numerous cases showing the possibilities of *A. lumbricoides* as a cause of unusual symptoms, or of no symptoms, came to light.

(1) The case already quoted of a soldier doing full duty harbouring at least thirty-seven worms with no apparent ill-effects.

(2) Baby B., aged 14 months, vomited two large ascaris—no symptoms or apparent ill-effects.

(3) Baby T., aged 20 months, very poorly developed physically and mentally, frequently off colour, though never seriously ill—treated for ascaris and put on seven pounds in next two months.

(4) Baby X., aged 15 months, seen by M.O. at 5 p.m., with a history of vomiting while at a children's party, and then being "very bad." The mother stated that it had been in hospital three weeks previously for one week suffering from diarrhoea, with blood and mucus. When seen the child was collapsed with a subnormal temperature and very poor pulse. No physical signs. It was treated for its immediate condition, and quickly came round and fell into a peaceful sleep. It was ordered syrup of figs. Next morning the child vomited three ascaris.

I am indebted to Sir David Galloway for the following notes on the two worst cases seen by him during the course of over thirty years' experience in Singapore :—

(1) "A Spanish boy, aged 7, who came from Manila (it was during the Spanish occupation of the Philippines). The diagnosis sent with him was tuberculosis of the lungs and abdomen, and his appearance certainly lent colour to such a diagnosis. There was a constant temperature of 102° F., frequent cough, intense anæmia, shrunken limbs and protuberant abdomen. The lungs were full of sounds, scattered equally all over, and the abdomen had the doughy feel which one associated with tuberculous disease.

"Sputum was negative and the lung condition was not that of tuberculosis. Curiously enough, he never passed a worm during the few days when the diagnosis was in doubt, but he vomited one shortly after his arrival, which gave an indication for treatment.

"I do not know how many he passed, but his aunt, in whose care he was, described them as being passed by the 'potful.'"

(2) "The second case was that of an Arab girl. On account of some political trouble the family had to remove themselves from Palembang, and they came here, in all about sixty persons.

"Every member of the family was heavily ascaris infested, but the palm seemed to be awarded to the girl in question. She was 17 years of age and had never menstruated, and was therefore not married.

"Physically she was a skeleton and the abdomen was enormous. The temperature was constantly high, respirations hurried, and there was oedema of the feet and hands. Albuminuria was present. There never was any doubt as to the nature of the illness, as worms were being constantly evacuated *per anum* and *per oram*. I was able to awake some interest in this case in some of the other members of the family, and they counted the worms which were evacuated during the first four days of treatment, after which the familial interest seemed to wane and the count was dropped. The number enumerated was 800, and worms were passed in small numbers for at least a week after the enumeration ceased.

"The interest in the case lay in watching the superadded symptoms, due to the toxæmia, gradually one by one disappear, and it is enough to say that within twelve months she had developed into a normal woman. Menstruation became established ten months after the 'great evacuation,' and the albuminuria disappeared about the same time."

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#### NOTES ON THE USE OF OIL FUEL FOR COOKING PURPOSES AND THE SYSTEM IN USE IN THE INDIAN STATION HOSPITAL, DEOLALI.<sup>1</sup>

BY CAPTAIN N. B. MEHTA.

*Indian Medical Service.*

OIL fuel has been used in the hospital kitchen at Deolali since May, 1918, and during this time no firewood has been issued. The oil is that used for bunkering steamers and for railway and other engines; it is a heavy oil, and when lighted burns with a dead yellow flame and gives off a large quantity of thick, black smoke. It has many advantages over wood and these are enumerated later.

A plan of the kitchen (scale two inches to one foot) is shown on page 55.

There are two reservoirs (four-gallon petrol drums) with stopcocks, one contains oil and the other water. Both oil and water are run into a funnel in a small stream and so get mixed. This mixture is carried by the pipe to the ovens. The reservoirs are mounted side by side on a cemented pedestal at a height of one foot three inches from the floor. The idea of mixing water with the oil is to produce partial atomization of the oil and thus to lessen the smoke production, which is considerable if only the oil is used.

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<sup>1</sup> At Aldershot field kitchens modified to burn oil have been issued for trial to regiments without previous experience of the method. Very good results were obtained when the kitchens were stationary; but on the move the results were not satisfactory, owing to the jolting on the high roads and the excessive production of smoke. The M.G.A. considers that if an oil cooker is to be used it should burn paraffin and be made on the principle of an oil stove. There might also be possibilities in the Primus stove system, where oil is burnt under pressure.—Ed.

The ratio of oil to water has to be worked out and regulated (stopcocks on each reservoir) so that the minimum quantity of oil is used with very little smoke coming out of the chimney.

The design of the ranges in which cooking is done is indicated on the plan. Indian cookers (chulas or combustion chambers) are constructed of brick-work in lime mortar, the joints being filled in solid so as to be as airtight as possible. The chimney is of sheet iron or brickwork not less than twenty feet in height. It is found that degchais of nineteen inches to twenty inches in diameter are the most convenient, but those of other sizes may be used. The diameter of the opening should be three-quarters of an inch greater than the diameter of the degchai. To make these openings fit the pots accurately, and to prevent escape of smoke through them a mud plaster is used. The plaster is laid all round the top of the ovens so as to form an accurate casing round the pot. The casing requires renewal once every fourth or fifth day as a rule. The same applies to the baking iron used for making chapatties (unleavened bread). The degchais should be set three inches to four inches deep in the combustion chamber, at the bottom of which is an iron plate ten inches by ten inches, and about one-eighth of an inch thick, to receive the mixture of oil and water. The edges of this plate should be turned up half an inch all round to prevent the mixture running off the plate. Owing to the high viscosity of the oil, in spite of addition of water, a pipe of not less than half an inch in diameter should be used and the pedestal for drums of oil and water be placed at a distance of about four feet six inches from the cooker.

To light the fires the following method may be used:—

A long piece of stout iron wire is taken, and at one end it is wrapped firmly with cotton waste, tied by means of ordinary string. This end is dipped in oil and lighted and is then placed inside the combustion chamber on the iron plate and kept there till the mixture of oil and water running through the pipe on to the plate gets lighted. To extinguish this mop, it is dipped quickly in the oil reservoir and kept submerged there for a few seconds.

To ensure steady working of the fire, the following directions should be carefully noted as they have been worked out by experience:—

(1) The iron plate at the bottom of the chula (cooking place) should be as clean as possible.

(2) Before starting the fire wrap a piece of waste round a stout wire, soak in oil and ignite it. Place it inside the chula and heat the end of the oil pipe. Do not start running the oil till the pipe is well heated.

(3) Turn on the oil slowly at first, and as it passes over the heated end of the tube it will be warmed up and ignite readily as it falls on the burning stick. The burning oil will drip on to the iron plate.

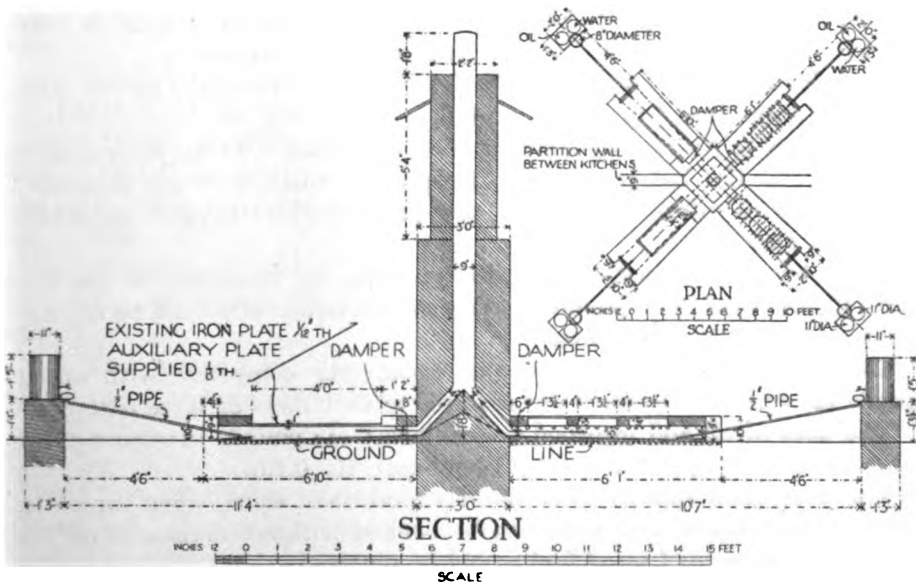
When the burning oil has spread out on the plate, turn on the water slowly. The flame will become much more intense, and showers of sparks will be produced.

(4) Now adjust the oil and water supply. If the water is in excess, it will boil on the plate, cause frothing of the oil and tend to put out the fire. In such cases cut off the water and increase the oil; allow it to burn until equilibrium is restored. When the flame is burning with a hissing noise turn on the water again.

(5) If the chimney is giving off a heavy, black smoke, too much oil is being used. The smoke should be black but thin, with no "smuts" in it.

This method is extremely easy to run, and there is nothing to get out of order. It is almost "fool-proof," and with a little patience the cooks can be very easily trained to use it successfully.

## OIL COOKER INDIAN



The use of oil fuel shows great advantages over firewood :—

(1) Owing to the structure of the cooking place no smoke escapes into the kitchen. The smoke from wood fires not only discolours the walls, but it is irritating to the eyes, even when dry wood is used. When the wood is wet chulas are well-nigh impossible to work.

(2) There is less heat in the kitchen as the heat is carried towards the chimney, and is not radiated into the kitchen. This ensures greater comfort in working, and no one appreciates the advantages more than the cooks themselves.

(3) The flame produced with oil is much steadier, and no stoking is necessary. The oil and water, once regulated, flow and burn steadily.

(4) The oil occupies much less space in storage. It saves labour and its transport is also easier.

(5) Oil is not affected by wet weather.

The results obtained with oil are uniformly satisfactory. The quality of the food is always good, and no complaints have ever been received that the oil in any way taints the food. The regular heat seems to ensure more even cooking, and charring or burning of chapatties does not occur, as is the case with the tawa (i.e., the flat iron plate on which chapatties are usually cooked).

The rate of cooking is highly satisfactory. With a set of three combustion chambers or chulas and one chapatti oven, two hundred rations can be cooked in three hours. It has been found that the expenditure of oil per ration varies inversely with the number of men cooked for.

Oil fuel, as used above, is well adapted for use in all military barracks, and especially in hospital kitchens. It has no disadvantages, is easily handled and stored and the saving in transport is considerable.

*Specification of oil used, etc.*—Oil fuel, first quality, is used for the stove. This can be obtained from the S. and T.

*Details as to the average amount of oil consumed.*—As the daily number of patients at the Indian Military Hospital is small, it is not possible to give any useful information about the quantity of oil required for a large number of diets.

It has been found that diets for five patients can be cooked on the stove with 112 ounces of oil (7 pounds). The same amount of oil will be required to cook diets for three patients.

*Comparative cost of oil fuel and wood.*—As compared with oil, 17 pounds 12 ounces of firewood are required to cook diets of three patients.

The cost of oil and firewood is as follows :—17 pounds 12 ounces of firewood, Rs. 0.4.6 ; 7 pounds of oil (112 ounces), Rs. 0.4.8.

The cost of oil appears to be slightly more than wood, when three diets only are cooked, but five diets can be cooked without increase of oil fuel, whereas an increase of wood fuel would be required.



## Travel.

### L'OISEAU ROUGE.

By U. P. A.

(Continued from p. 465, vol. *xlvi*.)

The third day out and we're on the Grand Trunk Road.

About halfway to Nowshera we crawl through the village of Pubbi. Literally "crawl" because it's ten chances to one that a cattle fair will be in progress; and the chief place of exhibit and centre of bargaining is on the G.T.R. itself. For a mile or so the road is packed with a dense mass of men and cattle, and it is quite impossible to move at more than 3 m.p.h. Pubbi is also a favourite haunt of bad characters; hence the strong police post.

At Pubbi a side road leads from the G.T.R., due south to Cherat.

Cherat is on the top of a ridge which runs east from the Kohat Pass, Afridis' Hills. Height about 4,000 feet. It is the summer station for the British battalions at Nowshera and Peshawar. It is a quaint place. A road runs along the ridge, and barracks cling to the steep slopes on each side. Note:—

(a) Disposal of rubbish and sullage water. By shoots; there is a clear drop of over 3,000 feet and no cantonment anywhere near the landing-ground.

(b) The distant view. On a clear day this is superb. To the north the Kabul River and the Himalayan snows. To the east the gorge of the Indus, where the mighty river cuts through the range on its way south to Khushalgarh.

(c) Chief occupation of inhabitants in midsummer. *Leit motif*, how to keep cool. The only solution is to adopt a waiting policy.

(d) The discovery of Cherat. When old General Roberts commanded at Peshawar his son—the late well-beloved Bobs Bahadur—was a very young officer and was his father's A.D.C. Sick rates amongst the British troops at Peshawar were very high, so the old general sent his A.D.C. and another youngster out to prospect. They found Cherat. They also found it was a good place for shikar; but in that respect it has now deteriorated a good deal.

Nowshera is twenty-seven miles from Peshawar. It stands on the banks of the Kabul, which is spanned by a road-railway bridge and two boat bridges.

The following observations may be made regarding Nowshera:—

(a) The town-planning scheme is of commendable simplicity, as the cantonment is built for a distance of two to three miles on each side of the G.T.R.

The residents are therefore able to see everyone who passes from east to west. They are also able to see everyone who passes from west to east.

(b) The golf course is constructed of bricks below, and sheet iron covered with a thin layer of sand on top.

It is roofed with an overhead catchment net to prevent the balls from hitting the moon when they bounce.

(c) The hotel and messes are famed for their fish. From the Kabul? No. No—from Karachi.

(d) There is a dâk bungalow. . . .

L'Oiseau Rouge leaves the G.T.R., crosses the first bridge of boats with a terrific series of clatters and bumps, climbs the steep bank on the far side and heads due north for Risalpur. This is a pleasant cantonment which is not built on each side of the main road. Its inhabitants sometimes eat and sleep, but mostly they play polo.

Forty-four miles from Peshawar we enter Mardan and, for reasons too numerous to mention here, we halt.

The Hop beams on the waiting multitude, Georgina is greeted with laughter, waving and cheers, and U. P. A. gets out and gets under in view of the run on the morrow.

Mardan is like Kohat. To do it justice it should have a special article to itself. So, for the moment, this inadequate notice must suffice :—

(a) Mardan is the home of the Guides, F.F.

Q.V.O.C. of G. is the only regiment in the Indian Army. Did I say "the only"? Sorry. *The only*.

It is famed for :—

(1) Christmas carolling. It is the custom on Christmas Eve for the subalterns of the regiment to pay a round of visits to the bungalows of the married officers, and to sing carols in the compounds. The married officers are quartered in the redoubts of the old fort. To enter the compounds you have to cross a deep, wide moat on plank bridges. When the last bungalow has been visited, the last carol sung, and the last wassail bowl emptied, the senior subaltern secretly removes the planks of the last bridge. The returning carol singers then plunge into the moat, bicycles and all. It is considered a point of honour with the subalterns to appear at church on Christmas morning on crutches and swathed in bandages. The regiment is so fond of music that, in the hot weather, the mosquitoes are trained in carol singing. That is why the married officers' bungalows are built on the edge of the moat.

(2) A museum registered under the Department of Archæology. When this building is not being used as a museum it is used as an officers' mess. As a rule it is used for both purposes at the same time. Of course the archæological exhibits comprise the *in-animate* contents of the building only; they are mostly Hindu-Grecian sculptures dug up during the construction of the great Swat Canal.

(3) The mess plate. This magnificent collection is kept in a special

strong room which is guarded by newly-joined recruits. The idea here is to keep temptation away from the older soldiers; it takes a man six months to realize that the contents of the strong room are, in truth, made of genuine precious metals.

(4) Certain renowned names. But in this connexion, although you may talk of "Lumsden of the Guides" or "Sam Browne of the Guides," you must not say "Battye of the Guides." "The Battyes" is correct, for every Battye belongs to the Guides. If there is a Battye who isn't in the Guides, well, he needn't be mentioned, poor fellow.

(b) Mardan is where Micky lives.

To mention Micky after the Guides may seem like descending from the sublime to the ridiculous. "May seem," yes; but not if you know Micky Sahib.

Micky, too, belongs to the F.F. He is pink-cheeked and chubby; he is always smart and soldier-like; his character is exemplary, with lapses; he rules the depot with a rod of iron, and yet there isn't a man in it who wouldn't cheerfully lay down his life for him at any moment if need be. He is in love with Georgina, and she—like all the rest—adores him.

I'm very busy on a most important job on the back axle but I've got to stop *now*. Micky wants to play mah-jong. There is no greater tyrant than a small boy, aged 5.

L'Oiseau Rouge begins the fourth day in good fettle. Yesterday's short run allowed the Hop time for some safkarna, and that does a car as much good as it does a horse.

We make for the north and bowl along through a fertile land covered with heavy crops and watered by innumerable irrigation channels, offshoots of the Swat Canal. Before the canal was made this country was an arid desert which produced nothing but trouble and crime. Now it is peaceful; a great tribute to British occupation.

We soon reach the railhead at Dargai (Malakand) and begin the climb to the top of the Malakand Pass; not unlike the ascent up to the Kohat Pass, but longer. On the way up you can see the head-waters of the Swat Canal emerging from the tunnel which has been bored through the mountain-side from the Swat Valley above, a fine piece of engineering.

The collection of buildings known as Malakand Fort cling to the steep hill-sides at the summit of the pass, surmount the neighbouring peaks and behave in a sort of mediæval, decorative fashion. A most attractive sight.

Leaving the fort behind, L'Oiseau Rouge runs down a steep hill into the valley of the Swat River, where is situated the birthplace of the canal. This valley is green and prosperous and leads by pleasant ways to Chakdarra, our outpost over against Swat.

The Kohat Pass is savage, the Khyber is scientific and the Malakand-Swat is smiling. And as for the effect of environment—compare the sullen,



quarrelsome-looking Afridi with the contented-looking Swati ; or the former's gloomy wrappings with the latter's gay blankets. There must be something in it.

After tiffin Mrs. Micky and Georgina sketch Chakdarra Fort. Mr. Micky tells me how the Service is going to the dogs. Then he forgets about this when he talks of the great day when Micky junior will join the regiment (F.F.).

The Hop regards the wayfaring Swatis with a toleration bred of a conscious superiority and audibly wonders when it will be time to return. A hint from such a high personage cannot be ignored, so we pack up and amble home, to be greeted at sunset and, alas ! at little boys' bed-time, by a very wide-awake chotta sahib, aged 5.

To-day's run : just under eighty miles.

The fifth day begins in a minor key. Georgina hates saying good-bye to Micky, and her mood affects me, for the Mickys of Mardan are the sort of folk one likes to be with ; and of how many folk can one say that in a whole-hearted and sincere way ? Not many when you come to count 'em up.

In forty-five minutes we have run back through Risalpur, recrossed the Kabul and left Nowshera behind. We are now on one of the best stretches of the G.T.R., tree-lined and alongside the Kabul. A cheerful and high-spirited river.

About sixteen miles from Nowshera this stream joins the mighty Indus just short of Attock. "Mighty" is the word in common use. No wonder ; no other word would do.

Few people know their own limitations. I'm sure I don't. But this limitation I *do* know : I cannot adequately describe this meeting of the waters. It is all so beautiful that the average man can but gaze and must perforce leave his impressions unsung. Isn't it depressing when you have seen something worth seeing, and you start to describe it with enthusiasm, and that bored look spreads over your listener's face ?

Halt for a few minutes two miles short of Attock Bridge and you will know what I mean.

Attock presents the following features of interest :—

(a) A fine bridge ; the only possible sleeping-place when the weather is at its hottest.

(b) A big Moghul fort which houses the bridge guard ; and now one of the very few places in N. India where there is elbow-room in cantonments.

(c) Ruins of an old Moghul city, now occupied by rats, dogs and mosquitoes.

A photograph of Attock is always unsatisfactory, because the charm of the place lies in its colouring : yellow, brown, black, red, greens and the great silvery river.

From here to Rawalpindi is a matter of sixty miles, and the road is varied and interesting the whole way. Not only the road, but the distant view as well.

To the north the Himalayas stand clear against the sky. The snows of this huge range can be seen from the G.T.R. for practically the whole distance—275 miles—from Peshawar to Lahore. I doubt if even America can surpass that.

Running eastwards, L'Oiseau Rouge carries us to the Haro River, Kala Serai and Hasan Abdal.

The Haro is a sturdy stream flogged by the anglers of 'Pindi. A fine new bridge is being built to carry the G.T.R. over the river and provide a secure stance for the bigger mahseer rods.

Kala Serai has fallen on evil days. It used to be the old posting headquarters for Abbottabad before the railway was pushed up to Havelian. It is a convenient starting-place for the trip to the ruins of the ancient Græco-Hindu city of Taxila.

At present Taxila is only half-exposed. Some day, when an expedition with capital and equipment arrives, Taxila will fill the illustrated papers. But we won't be there to see. Georgina abhors chunks of broken pottery and dirty old coins and things like that.

Hasan Abdal was a saint whose shrine is now a place of pilgrimage and repute. Near the village is the grave of Lalla Rookh.

If you wish to imbibe the atmosphere of the East in poetry, read "Lalla Rookh" and "The Light of Asia." I haven't read either myself, but you may take Georgina's word for it.

Hasan Abdal is also a jumping-off place for Abbottabad, the Hazara country and Kashmir. Indeed, this route into Kashmir is even more interesting and beautiful than the usual (because more convenient) one via Murree.

A word about Abbottabad:—

(a) It contains a regiment of Gurkhas. Also a lot of other troops; but they don't count.

(b) There are more rose trees in Abbottabad than in any other place of its size in the world.

The very hedges are made of rose trees; the famous Mardan rose, a magnificent white bloom.

(c) The name of this station is never mentioned by officers of the I.M.S. in mixed company.

The reason for this is to be found in the old tag—"The R.A.M.C. *always* get the best stations."

There are no R.A.M.C. personnel in Abbottabad. Better not mention the place at all. . . .

L'Oiseau Rouge leaves Hasan Abdal behind and the Hop heaves a sigh of content. Clear of the Frontier at long last!

Much thought and treasure and many lives have been expended on this small portion of our Empire, and the riddle of peace and security isn't solved yet.

There is a chronological table in "Campaigns on the North-West Frontier," by Captain H. L. Nevill, D.S.O., R.F.A. (1912). Here it is brought up to date. Probably nothing could better illustrate the magnitude and complexity of the Frontier problem than this bare recital of tribal names and dates :—

1849	Baizais.	1878	Zakka Khel.
1850	Kohat Pass Afridis.	„	Mohmands.
1851	Mohmands.	„	Zaimukhts.
1852	Ramzais.	1879	Zakka Khel.
„	Utman Khel.	1880	Marris.
„	Waziris.	1881	Mahsuds.
„	Black Mountain Tribes.	1883	Shirams.
1853	Hindustani Fanatics.	1888	Black Mountain Tribes.
„	Shirams.	1890	Zhob Valley.
„	Kohat Pass Afridis.	1891	Black Mountain Tribes.
1854	Mohmands.	„	Miranzai.
„	Afridis.	„	Hunza and Nagar.
1855	Orakzais.	1894	Mahsuds.
„	Miranzai.	1895	Chitral.
1856	Kurram.	1897	Tochi.
1857	Bozdars.	„	Malakand.
„	Hindustani Fanatics.	„	Mohmands.
1859	Waziris.	„	Orakzais.
1860	Mahsuds.	„	Afridis.
1863	Ambela.	1900	Mahsuds.
„	Mohmands.	1908	Zakka Khel.
1868	Black Mountain Tribes.	„	Mohmands.
„	Bizotis.	1919	Wazirs, Mahsuds, etc.
1872	Tochi.	1921	Wazirs.
1877	Jowakis.	1922 }	Mahsuds.
1878	Utman Khel.	1923 }	

But let us press on. The Hop has sighed again.

*(To be continued.)*



## Echoes of the Past.

### CHOLERA IN THE ARMY IN INDIA NEARLY FIFTY YEARS AGO.

BY MAJOR-GENERAL W. H. OGILVIE, C.B., C.M.G., K.H.P.  
*Indian Medical Service.*

I HAPPENED to come across the Medical Regulations for H.M. Forces in Bengal, 1881, and looked up various matters in order to compare the state of affairs existing then with that existing now. Two things attracted attention at once when compared with the Regulations for the Medical Services in India, 1925. The first was the change in the conception of the functions of the Military Medical Services. In the old book these are defined as the care of the sick, and the recommendation to C.O.'s of precautionary measures conducive to the preservation of the health of the troops. (In this sequence.) In the new book they are, firstly, the prevention of disease, and secondly, the treatment of the sick and wounded. Both the order of importance and the clearness of this order in the new book show how far we have travelled in the half century that has elapsed.

The second noticeable thing was the position towards cholera. In the old book there is three-quarters of a page in the text, and no less than fourteen and a half pages in a special appendix. In the new book there is only three-quarters of a page about cholera in an appendix on all infectious diseases. It is clear that cholera was viewed with terror, and it is only necessary to read Kipling to get an idea of what cholera meant in the days when the cause was still unknown. There is more than one instruction about preventing alarm and allaying alarm.

As the real cause of cholera was then unknown it is not surprising that the instructions were so copious in detail, but it is surprising that they should try and explain the cause of the disease and thereby leave confusion worse confounded.

In the following notes the statements are mostly in the words of the old Regulations, but the use of inverted commas has been avoided in order not to burden the text. No less than five different theories are involved, viz.: Place infection; something in the man's constitution; water infection; a miasma; and a true infection from man to man. These will now be illustrated by the Regulations themselves. In doing this there is no intention of belittling the efforts of our predecessors. There were many stout fellows before our noble selves, as the ring of cholera-camp graveyards surrounding most of the older cantonments down-country testify. Many a one contains the grave of a medical officer who "died of cholera while nobly attending on the patients suffering from that disease," as was carved on one stone I saw. No, they tried manfully to meet the attack, and these short notes merely emphasize once again the hopelessness of

expecting progress without knowledge. One mild criticism is perhaps allowable. When it was obvious that the cause really was unknown, was it wise to recount the supposed causes when issuing military instructions?

The theory that the disease was due to a **PLACE INFECTION** is supported by the following statements in the instructions: "It is dependent on local insanitary conditions, and therefore general sanitation should always be kept up to the mark." "But if the disease has actually appeared, more harm than good is likely to arise from any attempts at improvement which may then be made. This is not the time to cleanse foul drains or to remove nuisances which may hitherto have been neglected, and such probable causes of disease should in these circumstances be left undisturbed." (This is extraordinarily muddled thinking in view of the tenor of the rest of the instructions.) Whenever new buildings are being carried on it is most important with regard to the health of their future occupants that the ground and water in the neighbourhood should be protected from pollution. Cholera evidently attaches itself to particular localities; all infected localities are to be out of bounds; and evacuation of the site is the only remedy in which any confidence can be placed.

So strong was the belief in the infection of buildings that it is mentioned that even if fever or other diseases appeared amongst the men in cholera-camp, it was the less of two evils to let them suffer thus than to bring them back to buildings that might still harbour cholera.

That the disease was of the nature of a **MIASMA** is shown by the orders that the march to the cholera camp was to be at right angles to the prevailing wind, "or to the track of the disease." It is a pity that this latter point is not enlarged on as it might help in the elucidation of what was at the back of the minds of those who brought it forward. The latrines are to be leeward of the camp; and tents and grass huts are better than wards for the treatment of cases, as the air does not become contaminated and the ground can be changed.

Another theory that cholera was due to something inherent in the **CONSTITUTION OF CERTAIN MEN** seems indicated from the following instructions: Fatigues, and especially night duties, were to be avoided. Medical authorities unanimously condemn this baneful practice (i.e., drink) as a certain promoter of the disease. The men in camp were on no account to sleep on the damp ground, and were always to wear flannel belts. The usual regulations about the early detection of diarrhœa are also included.

The statement that cholera very often first appears in a hospital is somewhat unexpected, as it would naturally be thought that a hospital would be in a better state of sanitation than barracks.

**WATER** seems implicated as a cause, but only half-heartedly. Great care is to be taken that the water supply is not contaminated by organic matter; water is to be boiled as a precautionary measure; and the filters (Macnamara's) are to be taken into cholera camp after being cleaned and supplied with fresh charcoal. From the plan and specification of these

filters, they appeared little better than culture receptacles, and the way that the joints of the pipe conveying the filtered water were immersed in the unfiltered water was simply asking for trouble. Some of the readers of this may remember the case of a British battalion in the early 'nineties, when one of the pioneer investigators demonstrated the vibrio in the filters brought into camp with the battalion. As far as my recollection goes, this was the last of the terrifying outbreaks as described by Kipling.

The last of the alleged causes on which the instructions were founded is MAN TO MAN INFECTION. It is not clear whether the infection was supposed to be air-borne like scarlet fever, or by transfer from excreta to mouth as in enteric fever. Overcrowding is one of the predisposing causes of the disease; discharges from patients are to be carefully disinfected (this is one of the few occasions on which this word is used; "purify" is the usual term); sick attendants are not to use the patients' latrines, urinaries or wash-houses; clothes of sick attendants which become contaminated by the discharges of patients are to be purified; disinfectants are to be used in the latrines; the clothing and equipment of patients are to be boiled, baked, sunned, beaten or brushed according to their nature.

Among general subjects it is noticed that the establishment of sanitary cordons round cantonments is strictly prohibited; that the rules now published are founded on the general experience of the past; and that the officer commanding the station is responsible for carrying out all the measures laid down. It is stated that a lull in the epidemic sometimes occurs in the early part of the monsoon; it would be interesting if anybody could confirm or disprove this.

It is probable that few if any of the officers now serving have any personal experience of the conditions which the old instructions were meant to meet. My only experience of a real epidemic was amongst the civil population of the Jubbulpore District during the famine of 1897. Amongst the villages in the affected area the mortality was appalling, and in some of them there were not enough living left to dispose of the dead. Now even amongst the civil population conditions have greatly improved, so these somewhat disjointed notes have no more than an academic interest for serving officers. They may, however, not be without interest for the present generation, and it is with this end that the notes are published.

## HISTORICAL NOTES.

BY MAJOR J. E. M. BOYD, M.C.

*Royal Army Medical Corps.*

WHILST looking through some old Army Orders I came across the following, which may prove of interest to readers of the *Corps Journal*, especially when one takes into consideration the smartness and efficiency of the Indian Army at the present time.

General Orders by His Excellency the Commander-in-Chief.

Headquarters Camp, Lahore, 15th December, 1849.

At the late review of the troops on the plain of Meean Meer, the following egregious deficiencies were evident to all :

(1) That some commanders of regiments were unable to bring their regiments properly into the general line.

(2) One commanding officer of a regiment attempted to wheel his whole regiment as he would a company !

(3) Several officers commanding companies were seen disordering their companies by attempting to dress them from the wrong flank.

(4) When the line was ordered to be formed on the left column, some commanders deployed too soon, and ordered their lines (thus improperly formed) to "double quick" in order to regain their position ! This was all bad ; but it was worse to see these regiments on receiving the word to "double quick," at once charge with loud shouts ; no such order to charge having been given by any one, nor the word "prepare to charge," nor did any thing occur to give a pretext for such a disgraceful scene, exhibiting both want of drill and want of discipline.

(5) Bad as this was, it was not the worst. When these regiments chose to "charge," the Commander-in-Chief, to his astonishment, beheld the men discharging their firelocks straight up in the air, and he saw some men of the rear rank actually firing off their muskets to the rear over their shoulders as their bearers (he will not call them soldiers) were running to the front ! He feels assured that no such a scene could have occurred in any other regiments in the army : if ever such again happens he will expose the commanding officer of any regiment that so disgraces itself, in public orders, to the whole Indian Army. In the course of his service he has never before witnessed such a scene. No commander could go into action with a regiment capable of such conduct without feeling certain that it would behave ill ! The Commander-in-Chief will, therefore, hold commanding officers responsible (for they alone are to blame) that any soldier who shouts, or charges, or fires, without orders, be instantly seized, tried at once by a drum-head court-martial, and the sentence executed on the spot. Courts-martial which try such dangerous offenders will, the Commander-in-Chief has no doubt, uphold military discipline and military honour against outrageous and criminal disorder.

This order may be deemed severe ; the Commander-in-Chief means it to be so, for he will not pass over without animadversion faults which, if tolerated, would, in the event of war, produce certain defeat to this army. The reviews which the Commander-in-Chief makes of the troops are not to be taken as so many "chips in porridge." They are made for the purpose of ascertaining what officers are fit to command battalions, and there being no want of such in the Indian Army he will feel it to be his bounden duty to remove those who are not ; and whenever he finds a regiment "fire," "shout," or "charge," without orders from its commander he will, after this warning, remove the latter from his command.

The sepoy is both a brave and an obedient soldier ; and whenever he behaves ill it is in a great measure the fault of his commanding officer.

The drill and discipline of all armies rest mainly with the commanders of regiments and of companies. They are in immediate contact with the officers, non-commissioned officers and private soldiers ; and to them general officers must look for that perfect obedience, without which an army is an armed mob, dangerous to its friends and contemptible to its enemies.

The Commander-in-Chief does not hereby call on commanding officers to torment those under their orders by long and harassing drilling. But he does call upon them to instruct their officers and to instruct themselves and also their supernumerary ranks, that they are to seize any man in their front who dares to shout, or talk or fire, or run, without orders. General officers commanding divisions and brigades in this army are called upon to see that commanders of regiments do their duties in these points.

The Commander-in-Chief does not apply this order to all commanders ; he well knows that there are abundant first-rate soldiers and first-rate regiments in the Indian Army, but he applies it to those whose regiments are in bad order.

The Commander-in-Chief at the time was Lord Napier.





## Reviews.

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**DESCRIPTIVE ATLAS OF VISCERAL RADIOGRAMS.** By A. P. Bertwistle, M.B., Ch.B., F.R.C.S.E., and E. W. H. Shenton, M.R.C.S., L.R.C.P. London: Henry Kimpton. Pp. 245 with 330 illustrations. Price 21s. net.

This atlas produced by the above authors presents a very comprehensive series of modern technical radiograms and has the additional advantage that many of the systems have been illustrated and augmented by typical specimens collected from such specialists as Dr. Spriggs (alimentary), Mr. Kidd (urinary) and Dr. Rowden.

The volume together with its companion on bones, etc., also by A. P. Bertwistle, now forms a very complete guide to the whole subject of interpretation of medical and surgical radiograms, excluding localization.

The work of interpretation constitutes "Medical Radiology" and with the technical production of good films and reproductions such as these, better and more accurate results must follow.

The supply of accurate information is the aim of the radiologist, and this volume will help surgeons, physicians and radiologists themselves in many ways, not the least being that the all-important fluoroscopic notes made prior to the making of the film have been added; the importance of this in chest and abdominal radiology cannot be over emphasized.

The line drawings attached to most of the radiograms give rather a false idea of the ease of completing a radio-diagnosis, as the deductions from appearances of many radiograms are almost impossible to convey on paper to anyone who has not actually conducted the examinations.

To study this book in detail is a real pleasure, but it is a big undertaking for those whose knowledge of interpretation is scanty, and it will bring home to many not only the great scope and usefulness of the subject, but also, in particular cases, the limitations of the information that can be deduced.

The production of the book is excellent, and all the plates are of the highest radiographic and lithographic quality.

D. B. McG.

**ORTHOPÆDIC SURGERY.** By W. A. Cochrane, F.R.C.S.E. Edinburgh: E. and S. Livingstone. 1926. Price 21s.

The author of this book has aimed at producing a manual of ready reference for students and practitioners, and in this he has succeeded admirably. It is not a manual of orthopædics, and those requiring detailed information of treatment will have to seek elsewhere.

It is the first book of its kind published in this country, as it deals with the modern conception of orthopædics, and there must be many members of the medical profession who have often sought for information as to the

*raison d'être* of the osteopath without wishing to explore the larger volumes on this subject by American authors.

Part I of this book deals entirely with the mechanistic conception of disease as originally formulated by Goldthwait of Boston.

Part II is a good exposition of the ætiology, prevention and treatment of deformity. The teaching is chiefly that of the American school represented by Goldthwait and Osgood. Sir Harold Stiles has also largely contributed.

The author lays stress on the neglect of the chronic type of case; and points out the wide field wherein lies a practical ideal for the reconstruction and rehabilitation of such cases. With this end in view he emphasizes the necessity for the ability to diagnose the potential cripple, rather than the treatment of any fully developed condition.

Much attention has been paid in recent years to the importance of physique and correct posture in relation to the art of medicine, but unfortunately the majority of the medical profession in the British Isles have so far failed to realize either the importance or scope of this mechanistic conception of disease. The ignorance which at present surrounds this subject will be very largely dispelled by such an able contribution to the literature of the subject as has been produced by Dr. Cochrane.

The book is abundantly illustrated and the typescript is good.

R. R. G. A.

**THE TREATMENT OF THE ACUTE ABDOMEN.** By Zachary Cope, B.A., M.D., &c. London: Oxford University Press: Humphrey Milford, 1926. Pp. xvi + 238. Price 10s. 6d. net.

The publication of "The Treatment of the Acute Abdomen," by Zachary Cope, B.A., M.D., M.S.Lond., F.R.C.S.Eng., occurs at a very opportune time.

The advisability of medical practitioners, other than consulting surgeons, undertaking major surgical operations has been discussed in the medical press during the past year.

Views for and against this practice have been freely expressed, and the subject may still be considered an open question.

When a patient is ill he places himself unreservedly in the care of his medical attendant, and the doctor accepts this trust fully and without reservations. Any indefiniteness or qualification of this responsibility would in practice be found unsatisfactory.

If the medical man in charge of a case is able to perform the operative treatment his patient may urgently require, no valuable time need be lost by waiting until the services of a consulting surgeon can be obtained.

Mr. Zachary Cope's book is a clear and reliable guide to medical men faced with the necessity of providing urgent operative treatment for their patients, when a consulting surgeon is not available.

Practitioners in country districts or abroad will find this small volume

invaluable, as they are unlikely to have in their possession the large works on operative surgery.

Even when a consulting surgeon is available, a careful perusal of Mr. Zachary Cope's book will help the local medical practitioner to realize the requirements for the operation, and thus enable him better to anticipate the needs of the visiting surgeon.

The book is divided into two sections, the first being devoted to a detailed description of operative technique, while the second deals with after-treatment.

In the first chapter of the book the surgical instruments recommended for acute abdominal work are fully described, and important points in connexion with the number and pattern of these instruments are pointed out.

The actual cause of an acute abdominal condition is sometimes uncertain until the abdomen has been opened, and the surgeon must have ready certain accessory instruments and apparatus in order to be prepared for any emergency. A description of these accessory instruments is given, and the various abnormal conditions which may necessitate their use are fully described.

The second chapter deals with the operative details involved in opening and closing the abdomen. While the most suitable incision for any particular case must depend upon the location of the lesion, the author recommends the right para-medial line of incision when the diagnosis of the case is a provisional one. Very free access is obtained to the abdominal cavity through this incision, and it does not predispose to hernia formation afterwards.

The operative treatment of appendicitis is very fully described, and the various difficulties which the surgeon may meet with are mentioned, together with the best way of dealing with each of them.

With regard to the treatment of appendicitis when a local abscess has already formed, the author in these cases recommends that the local abscess should be incised and drained, without an attempt being made at the same time to remove the appendix, appendicectomy in these particular cases being often a very difficult and delicate procedure which is best reserved for more skilled and experienced hands.

The chapter on post-operative complications of acute appendicitis and their treatment will be found most useful, not only to surgeons undertaking operative work, but also to those who may have the after-care of cases which have been operated upon by another surgeon.

The operative treatments of perforated gastric ulcer, acute pancreatitis, acute intestinal obstruction and strangulated hernia, are all dealt with in a most practical and thorough manner.

The accompanying illustrations are clear and help greatly to explain and amplify the text, which is necessarily condensed owing to the small size of the volume.

In dealing with the subject of gut resection, the author gives in full the various important points which should guide the surgeon in dealing with damaged intestines. With regard to intestinal anastomosis, the author prefers the end to end method of union, but the lateral form of anastomosis is also described.

The chapter on ectopic gestation and ovarian cysts, while somewhat condensed, deals with the subjects in a clear and practical way. The treatment of acute cholecystitis and general peritonitis is included.

The second section of the volume contains chapters on dressings, nursing, diet and the treatment of post-operative complications.

This book is the companion volume to the author's "Diagnosis of the Acute Abdomen," and like it is essentially practical in its outlook.

The busy medical practitioner who may find difficulty in obtaining the information he requires from the large surgical works will find in these two small books all the surgical information necessary for acute abdominal operations presented in the clearest and most accessible form.

C. C.

**LIGHT TREATMENT IN SURGERY.** By Dr. O. Bernhard (St. Moritz).

Translated by R. King Brown, B.A., M.D., D.P.H., M.O.H. (Bermondsey), and Lecturer in Public Health, Guy's Hospital Medical School. London: Edward Arnold and Co. Second edition. Pp. 317, 104 illustrations. Price 21s. net.

This book by Dr. Oscar Bernhard is a very comprehensive study based on some thirty years' experience of actinotherapy. It has been translated into English by Dr. King Brown.

The history of artificial sunlight is dealt with in a fascinating and interesting way.

The book is divided into two parts dealing respectively with general aspects, e.g., Light, Light Biology, Pathology of Sunlight, Climatology, and special aspects, e.g., the indications and technique of specialized applications of the various forms thereof.

Many of the author's cases and results are really marvellous; he, however, recognizes that these miracles are due not only to sunlight but also to the climatic conditions under which he works in Switzerland.

Anyone who has sampled the light and air of St. Moritz can well understand the benefits patients receive when under the care of such an experienced observer as Dr. Bernhard.

The book is well illustrated and is the very last thing in treatment of this kind, but one must always remember that such consistently good results are not to be expected in the less invigorating air and gloom of the English winter.

D. B. McG.

THE CLINICAL STUDY OF MENTAL DISORDERS. By Lieutenant-Colonel J. R. Lord, C.B.E., M.B., M.R.C.P. London: Adlard and Son and West Newman, Ltd. 1926. Pp. 82. Price 6s.

This book is the Presidential Address at the annual meeting of the Royal Medico-Psychological Association in July, 1926.

Colonel Lord commences with the following sentence, which indicates the trend of his address :—

" . . . I should address you on some aspects of the practice of psychiatry, especially in regard to possibilities and lines of progress in the future and as to how the Association might better assist their materialization. The aspect I wish to dwell upon is that which is the title of my address."

The author is co-editor of the *Journal of Mental Science* and Hon. Secretary of the National Council of Mental Hygiene and speaks with great knowledge and experience on the subject of clinical study of mental disorders, pleading for the furtherance of research and clinical psychiatry in its widest bearings, properly organized and routine team work in the investigation and treatment of individual cases, and the reconstruction of psychiatry as a science, in close partnership with general medicine.

The relation of psychiatry and general medicine is discussed, and the reasons given for the fact that British psychiatry grew up apart from that mutual collaboration and co-operation which has been so beneficial to other branches of medical science, and the hope is expressed that psychiatry now appears to be returning "not indeed as an errant child, but as an adult in the full vigour of life, seeking, not an apprenticeship, but a partnership, and bringing a capital—a rich offering of medico-psychological knowledge and experience, and something for which general medicine has begun to feel the need—and so affecting a union full of advantages to both, and all to the benefit of sick and suffering humanity."

The methods of approach to clinical psychiatry are fully discussed, and the team work which is so desirable and essential in the treatment of mental disorder, involving as it does the psychical and physical aspects, receives attention in considerable detail.

The importance of detail work on individual cases is very great, there must be examinations conducted by specialists of all kinds in close consultation, "the issues are so momentous, the problems so baffling, the territory so unexplored, that psychiatry as a speciality needs all the aid that can be given by medical science and all its branches. . . . The psychiatry I envisage covers that practised by the general practitioner, the neurologist, and the mental specialist, to which must be added that of the ear, nose and throat specialist and the dentist."

To build up the wider psychiatry more mental clinics in connexion with the medical schools for teaching purposes are necessary as well as a greater offering of clinical psychiatry in the public mental hospitals.

The relationship between psychiatry and neurology is also discussed. This has been summed up by Head, who said, "we work in the passageway between the physical universe and the dwelling place of the mind."

The author concludes his address by saying that he started out with the intention of being severely practical, but fears his remarks have been mainly idealistic and philosophical. With this we do not agree, because throughout the address there is a very distinct path, hilly it is true, with delightful scenery around and often obscured by tropical vegetation, but leading to "a clear sky in the distance which gives promise of a brighter future for the wayfarer and hope of success to crown his efforts." "So may it be with psychiatry."

It is a most able address at a time when the problems of mental disorder occupy much time and thought, from their medical, legal, and sociological aspects, and have such great bearing on the future of our race.

W. L. W.

SPECIAL REPORT SERIES, No. 107: MEDICAL RESEARCH COUNCIL. "THE EFFECT OF TREATMENT ON THE WASSERMANN REACTION OF SYPHILITIC PATIENTS." Published by His Majesty's Stationery Office, London. Price 2s. 6d.

"The Effect of Treatment on the Wassermann Reaction of Syphilitic Patients," by Doctors E. E. Glynn, R. E. Roberts, and P. M. Bigland, gives a detailed account of the effect upon Wassermann reaction of the standard admission course "914," grey oil, etc. A detailed study, in 503 patients, of Wassermann relapses after the admission course is given as well as an account of the influence of continuation treatment with mercury, and of "no treatment" in the first Wassermann relapse in 109 patients.

The failure of continuation treatment as regards its effect upon the Wassermann reaction is dealt with in detail and the authors suggest alterations in this course.

An excellent chart has been devised by Dr. Roberts, which shows for each patient the relation between the Wassermann reaction and the various forms of treatment.

The exact nature of the standard admission course is described, and it is pointed out that the investigation could only deal with 711 out of 3,429 patients treated, e.g., one-fifth, on account of their inadequate attendance at the clinic.

A most valuable addendum to this report would be the study of the effect of the "inadequate treatment" on the Wassermann reaction in the four-fifths who did not complete the course, and a comparison of the results with those obtained in the patients who submitted to full courses of treatment and regular investigation of their serum reactions. The technique of the Wassermann reaction employed throughout the investigation was No. 4, described in the Interim Report on the Wassermann Reaction, published in 1918 by the Special Committee on the standardization of pathological methods appointed by the Medical Research Committee.

A special Wassermann machine is described and was used in the work

in order to shorten the time period necessary to carry out the technique in the case of large numbers of sera.

Tables showing the positive and negative errors in the delivery of 0.5 centimetres of distilled water indicated that in the case of the Wassermann machine, such errors were very low and almost the same as the lowest obtained by the pipettes, and definitely lower than those obtained by the burettes.

The drop error, so troublesome to those who have used dropping machines for the delivery of Wassermann doses and amounting on an average to eight per cent, is eliminated by the suddenness with which the flow of fluid is cut off after each distribution.

The authors concluded that the No. 4 technique, judged by the analysis of their percentage of error, was very accurate.

The statistical tables all indicated that the sooner syphilis is treated the greater is the probability of cure. In 1922, Kolle showed that salvarsan cured infected rabbits if treatment was started within forty-five days, but failed when ninety days had elapsed after infection.

Finally, the authors conclude from their statistics that: (1) Mercury tablet courses definitely do not diminish the relapse incidence, and (2) grey oil definitely increases the relapse incidence of syphilis. They emphasize the point that their conclusions as regards the value of mercury refer only to its administration in Wassermann negative, latent syphilis, and that its value in clinically active, Wassermann positive syphilis is not questioned.

**TYPES OF MIND AND BODY.** By E. Miller, M.A., M.B., M.R.C.S., D.P.M.  
London: Kegan Paul, Trench, Trübner and Co. 1926. Pp. 132.  
Price 2s. 6d. net.

Dr. Miller has written a charming essay, which is published as one of the medical series of "Psyche Miniatures."

It consists of four chapters and a bibliography. The first chapter discusses the difficulty of classifying human beings into types, but points out the easy way of doing so by the study of types of physique, as has been done by Dr. Ernst Krebschmer, of Tübingen. The resulting two types evolved are the psychic and the asthenic, with certain offshoots from them.

The second chapter considers the physiological background, with special reference to chemical pathology, the internal secretions and the influence of the nervous system, especially the vegetative nervous system. A concise and brief description of the known effects of each of the endocrine glands is next given without any attempt at being dogmatic.

In Chapter III we pass from the realm of physical phenomena to that of the mental, and, as the author says, we seem to move from one language to another. Types here are only seen in extremes, and only in the examination of large numbers does grouping become possible. Again, two main types may be noted, the manic depressive and the schizophene group;

these opposite forms of mental disorder represent the morbid and exaggerated development of one or the other of the tendencies which are common to us all. These types are discussed with reference to the physical types.

The last chapter, entitled "Cross Currents," shows how the types may suffer great modification and be apparently disguised—John Bunyan, Byron, John Milton, with special reference to his "Paradise Lost," are here discussed and analysed, and the conclusion is arrived at that "in order to envisage the whole character of man we must view him, not as a body, nor as a mind, but as an integrated dynamic system of forces which in its inheritance and its own history wears the fabric of personality."

To those whom the above résumé interests the book is very strongly recommended; it contains much real medical knowledge, and is delightfully written, its interest being increased by the author's easy humorous style.

W. L. W.

**PRACTICAL NURSING FOR MALE NURSES IN THE ROYAL ARMY MEDICAL CORPS AND OTHER FORCES.** By Colonel E. M. Hassard, A.M.S. (Retd.) and A. R. Hassard. Second Edition. London: John Bale, Sons and Danielsson. 1927. Pp. xvi + 407. Price 4s. 6d. net.

This excellent manual, the first edition of which was published when Colonel Hassard was on the active list of the Royal Army Medical Corps, brings the subject of practical nursing well up to date. The chief features in the new edition are a chapter on radiant heat, electricity and massage, by Miss Staveley Skinkwin, late head masseuse, Fort Pitt Military Hospital, Chatham, and notes on insulin treatment in diabetes by Miss Millicent Ashdown. Other chapters cover all the essential subjects which nursing orderlies in military or civil life should master, and which the authors explain clearly and practically. In this respect the opening chapters on bed-making and washing of patients are exceptionally well described. The remaining chapters deal with the observation of patients, the application of various measures and appliances in the nursing of patients, and the special points to be attended to in the nursing of different classes of disease, in the preparation and after-treatment of operation cases, in cleaning ward utensils, and other details. There are thirty-seven chapters in all, and a good index. The chief defect in the book is the almost entire absence of illustrations or descriptive sketches. Its value would have been enhanced by a more liberal supply of these. It is a work, however, which we can thoroughly recommend to the nursing orderlies of Colonel and Mrs. Hassard's old corps, and to those of them who are now engaged in nursing in civil life.

**AN INDEX AND HANDBOOK OF X-RAY THERAPY.** By Dr. Robert Lenk, University of Vienna. Translated by T. I. Candy, M.B., D.M.R.E., Newport, Mon. Oxford University Press: Humphrey Milford. 1926. Pp. 120. Price 6s. 6d. net.

This is an admirable translation in handbook form, by Dr. Candy, of the technique and formula of Dr. Lenk. The book is claimed to be more useful



for the general practitioner than for the radiologist, but I think it is more a labour-saving book for the specialist, as the average practitioner who includes X-rays in his daily work cannot have time to deal adequately with radiotherapy to the extent detailed herein.

The technique and formula are those of the Vienna school and have been produced after much experience and thought, and at present cannot be bettered.

The adoption of the metrical system must come eventually, but it is sometimes difficult for us to grasp at first.

There is no attempt to insist on a rigid technical standardization of the X-ray dose, or on a biological standard, as such margins are given that the dose really becomes a clinical problem.

MANUAL OF MEDICINE. By A. S. Woodwark, C.M.G., C.B.E., M.D., F.R.C.P. Third Edition. Oxford University Press: Humphrey Milford. 1927. Pp. xi + 523. Price 15s. net.

The popularity of Dr. Woodwark's "Manual of Medicine" as a vademecum for students and general practitioners, especially for those who have come under his teaching as lecturer on medicine in the Medical School of the Westminster Hospital, is evidenced by its reaching a third edition. The Manual was first published in 1912; but the remarkable advances in the causation and knowledge of disease during and after the war alone would have necessitated a revision of practically all manuals of this class. In his revision of the second edition, which was published in 1920, the author has managed to retain the original character and size of the book, while introducing many alterations and additions to the text. When put to the test of certain war experiences, such as food deficiency diseases and war neuroses, the volume falls short of our expectations. The references to these subjects are too concise, and, in our opinion, do not give a true picture of the conditions. For example, it is scarcely correct to state that scurvy is "always associated with defective hygiene, overcrowding, and physical and mental fatigue." It would have been more correct to associate it with conditions of famine such as occur in sieges, and it may occur where there is neither overcrowding nor defective hygiene provided the essentials in dietary are defective. The same may be said of the author's treatment of the subject of beri-beri, which he states to be endemic in certain localities and certain ships. We fail to see how it can be endemic in certain ships. A better description would have been to say that it affects communities whose dietary consists chiefly of highly-polished rice, a condition which is not necessarily restricted to certain localities and certain ships. As regards war neuroses the author appears to give undue prominence to exposure to concussion from the explosion of powerful shells without visible injury, and probably "also to poisoning caused by carbon monoxide set free in the explosion of shells." We know of no scientific basis for these statements; on the contrary, the experience

of the war attributed so-called shell-shock to conditions quite apart from concussion or poisoning by gas.

No doubt the author has endeavoured to produce a manual suitable as a guide for medical students, but, from the point of view of the general practitioner, it will be found too condensed. Such points as differential diagnosis and prognosis are in many cases referred to in a manner that does not help the reader or are omitted altogether. In this respect the book may be described as occupying a place in medical literature half way between a *memoria technica* for students and the more comprehensive treatises on the practice of medicine.

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## Correspondence.

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### THE STERILIZATION OF SMALL QUANTITIES OF WATER.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—Major Hattersley has described in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS of February, 1927, a method of sterilizing small quantities of water, e.g., two gallons upwards. Still smaller quantities, e.g., a glass or a water-bottle, may be efficiently sterilized by the following method, which requires no skill, no measuring apparatus, and can be used anywhere by anybody :—

A strong solution of the ordinary stabilized bleaching powder, obtainable in every military hospital, is made by adding a handful of the powder to a water-bottle, or about an inch in the bottom of an ordinary 4-ounce medicine bottle. The bottle is then filled with water, shaken for a few minutes, and allowed to settle. The supernatant fluid forms an excellent sterilizing solution, which will keep its chlorine content unaltered for about a month.

(1) A glass of water is treated simply by stirring it vigorously with a match which has been dipped to the hilt in the solution.

(2) *Water-bottles.*—A wire is fixed to the cork of the water-bottle, extending to the bottom of the bottle and about as thick as a match. This is dipped in the solution for a few inches, and the cork and wire applied to the bottle of water, which is shaken thoroughly. The taste of chlorine in either of these cases is so slight as to be negligible, even if tasted immediately after adding. It is better to wait a quarter of an hour before drinking, however, so as to be sure of sterility. Bacteriological tests were recently made in Lahore of this method, using a clear water which contained lactose-fermenting organisms in as small a quantity as 0.1 cubic centimetre. These were sterilized immediately, or rather as quickly as tests could be taken after adding the sterilizing solution. The presence of

chlorine in the water so treated, and therefore its sterility after a wait of, say, a quarter of an hour, may be proved if a small bottle of starch iodide solution is carried along with the bleaching powder.

(3) Wash-basins in Indian trains may be sterilized, both water and basin, in a few minutes, by adding ten drops of the fluid and stirring. Here taste does not matter, and a large quantity like ten drops produces almost immediate sterilization.

(4) The solution contains about four per cent hypochlorite. If diluted with water seven times, it forms a good wound antiseptic, resembling Dakin's solution.

I am, etc.,

D. T. M. LARGE,

Major, R.A.M.C.

### "APPRECIATION." A REPLY.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—I have read, with much interest, the article by Major A.C. Amy, D.S.O., R.A.M.C., in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS for May, 1927, entitled "Appreciation: A Review in Two Parts," the more so as I have a rather guilty conscience in the matter, having been, I fear, one of the candidates taking part in the examination (to the sorrow of the examiners), to which Major Amy refers. I do not, however, hold myself responsible for the "encyclopædic essay" mentioned by him, though possibly my attempt may have been of even less value.

Some time ago, I submitted an article to the Corps Journal entitled "Medical Training in India." Hearing later that the direct submission of articles was forbidden, I asked for the article to be returned to me, which was done. I re-submitted the article, in duplicate, through the "usual channels," but it was returned to me by one of the intermediate offices with the request for a further copy. As I was seedy at the time, and had neither time nor inclination to make out any more copies, I put the article into my file, where it still remains.

What I was trying to show in the article is brought out by Major Amy, as given in his second "excuse" made by the candidates, that the reason why practically valueless appreciations are submitted is, that owing to existing conditions, little or no instruction can be given to prospective candidates to prepare them for the examination. Lectures are of little practical use and on manœuvres the staff is usually too busy with the military duties to allow much attention to be paid to medical and other special branches of the Service.

Medical manœuvres are occasionally held; these are of the utmost value to those able to attend them, but are usually more or less local, and few medical officers, outside the district, are able to attend.

The question now arises: What information is, at present, available for officers who wish to sit for their promotion examination?

Tactical exercises are few and far between. If a local brigade commander wishes to include medical operations in his scheme he, almost invariably, takes out to act on his staff the Senior Medical Officer who has already passed the examination or missed sitting for it owing to his having been promoted during the late war, instead of taking one of the senior majors who has not yet qualified for promotion and to whom the exercise might prove of some instructional value.

The only available literature on the subject is contained in the numerous conflicting articles in the Corps Journal, which, though admirable in themselves, are, as Major Amy states, only the personal opinions and experiences of the writers.

All these articles are read, *ad nauseam*, by the candidates, so that by the time the date of the examination has been reached each has a complicated mass of information, each item of which fights for supremacy in the few cells of brain tissue left to him, he having exhausted most of his intelligence in trying to sort out the grain from the chaff in the afore-mentioned articles and is, by the time of the examination, on the border-line of acute mental and bodily disintegration, through overwork and the fear of being "ploughed."

There is little doubt but that the examination is taken very seriously by all candidates, and that it is a serious problem for them and will continue to remain so until some more satisfactory method of acquiring information is evolved. Those who were on active service during the late war picked up much useful information from their experiences, but a race will soon spring up members of which will not have had these opportunities of acquiring knowledge; it is for these that improvement is required.

What seems to be needed is a special course of instruction, under very efficient teachers, including one from "G" Branch, which can be attended by all majors who are about to sit for their promotion examination. The number of candidates for each examination is not large and it should be possible to spare them for a short course at some centrally situated station, either at home or abroad, or, failing this, to get some one attached to "G" branch to write a typical appreciation, which could be published in the Corps Journal for the benefit, not only of those yet to pass, but also for those who may some day have to write an appreciation for the information of some G.O.C. in C. on active service.

I feel certain that those who sat with me at the examination in question will agree that, had such an article been available at the time of the examination, we would not have submitted either "encyclopædic essays" or "gigantic treatises," and that many years of life and fewer grey hairs would have been the lot of our indulgent examiners.

I am, etc.,

J. E. M. BOYD,

Major, R.A.M.C.

## Notice.

---

### AVENYL.

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<sup>1</sup> E. Muir, M.D., F.R.C.S., *Indian Journal of Medical Research*, 1926, vol. xiv, No. 2, p. 291.

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# Journal of the Royal Army Medical Corps.

## Original Communications.

### MAN-POWER AND THE MEDICAL SERVICE IN RELATION TO SOME OF THE PRINCIPLES OF WAR.<sup>1</sup>

By MAJOR T. J. MITCHELL, D.S.O.,  
*Royal Army Medical Corps,  
Deputy Assistant Director-General, War Office.*

IN discussing "Man-power and the Medical Service in Relation to some of the Principles of War," e.g., concentration of superior force, moral and material; economy of force; mobility; and co-operation, I wish to state most emphatically that I believe the medical service exists to assist the army in the field, and that all sections of our Corps are necessary for the well-being of that army. I feel that when our President coined the phrase "a groove and how to get out of it," he was trying to get us away from the present-day habit of taking things casually as we find them. I believe such a call is necessary, and I shall endeavour to follow it to-night.

Our official textbooks stress the usual functions of the medical service—preservation of the health of the troops, treatment and care of the sick and wounded, replenishment of medical and surgical equipment and the collection and evacuation of sick and wounded. But what of the wider issues? We seldom refer to economic facts and our ability to save the State both men and money. The Medical Services have, so far, offered no contribution to this important subject, probably because we have been concentrating on our tactical and technical problems. I should

<sup>1</sup> Reprinted by kind permission from the War Section of the Royal Society of Medicine.

like to direct your thoughts towards a wider conception of the Medical Service in its relation to the Army, the State and humanity.

Man-power and attrition were important factors in the Great War, and they are likely to become even more important in future wars. The French realize this, for it was stated in the French Chamber that another war "would not be merely a military war, but would involve the whole nation, throwing all classes and both sexes into the fight, and absorbing the entire resources of the nation." It is right, therefore, that we should reconsider our position and contribute to the common stock the results of our unique experience during the Great War.

Our functions as a medical service are like a commercial company in which those asked to take shares are given no information as to the dividends, and I feel that if I were an Army commander in the field and had to support an efficient medical service, my first question to my Director-General would be: "Will you inform me how many men, or what percentage of casualties you will save and return to active duty?" Some of you who entered the Service determined to retain hold of some special professional subject throughout your career might be able to tell the number treated for a particular disease and made fit for duty in a short time. Others, like myself, who were willing to take whatever the goddess of chance cast in their way, might have more difficulty. Personally, I have no complaint against the goddess, but to-night I have certain qualms because I am parading for the first time a horse bred by a famous statistical stable, the "Medical Research Council," almost warned off the course by the Finance Department at the War Office and which has never appeared in public before. Our late revered chief, Sir William Leishman, persuaded me to train this dark horse, and the first time I mounted him I was thrown into a gloomy and uncharted forest, known as the Medical Statistics of the Great War. Fortunately, my national caution enabled me to ensure my official life by retaining the right to nominate my own colleague, and it is owing to the loyal co-operation of my colleague, Miss Smith, that I am able to present to you some interesting new facts.

In presenting these figures let me say definitely that of necessity they are all approximate, but they are sufficiently accurate for the lessons I wish to draw from them. I specially ask you to note the following points:—

- (1) The large numbers of men constituting the different forces.
- (2) The different countries and climates in which we operated.
- (3) The number of followers attached to some of the forces.

#### (1) NUMBERS.

With this table as a basis, the broad questions of recruiting, training, supply of troops fit for Eastern theatres of war, billeting, rations, clothing, transport and the provision of hospitals, should be considered from the point of view of possible future wars. As Field-Marshal Sir William



TO THE  
AMERICAN

Robertson aptly said : " The longer peace continues the more difficult it is to prepare for war."<sup>1</sup>

The medical services are now guided by men who won their spurs on the field of battle. They are young, active and experienced in dealing with the casualties and sick among large bodies of men, and they will enhance the glorious reputation we had earned at the end of the last war, because their memories are still fresh. But what will happen in ten or fifteen years? We have entered upon a régime of financial stringency, and a service nurtured on that policy is starved, and starvation leads to anæmia and inertia. This is exactly what happened in 1914 : witness our opening disasters in almost every theatre of war, and especially in Mesopotamia. I remember well my first experience of that country. I had come from France with broadened views ; the conditions were brought home to me most forcibly when I saw a man who had lain for ten days on a river boat with a compound fracture of the thigh. This was at the base. Further up the line, few or no medical arrangements were made, or could be made, for there were neither men nor material ; it was largely due to this that the *morale* of the British troops was low, and without *morale* among the troops no commander in the field can make good. The rot was stayed by the arrival of the medical units of the Indian Corps from France, whose endurance and organization had been stimulated by hard experience on the Western Front. Later the position was consolidated and reorganized into one of the finest shows we had. What happened in Mesopotamia will happen again, if in your spare hours you are content to think in battalions, brigades and divisions, and do not dream of and work out the broader medical requirements of a nation in arms.

## (2) COUNTRIES.

My second point is to draw your attention to the varying climatic and physical features of the countries in which the Great War was fought.

TABLE II.—PROPORTION OF SICK TO WOUNDED IN CERTAIN THEATRES OF OPERATION DURING THE GREAT WAR, 1914-18.

Theatre of war	Sick	Wounded	Proportion sick : wounds
France ... ..	3,494,165	1,983,748	1.8 : 1
Italy ... ..	57,172	4,689	12.1 : 1
Macedonia ... ..	508,999	18,961	26.8 : 1
Dardanelles (British only) ... ..	145,154	49,190	2.9 : 1
Egypt and Palestine ... ..	503,377	37,193 <sup>1</sup>	13.5 : 1
Mesopotamia ... ..	822,803	51,388	16.0 : 1
North Russia ... ..	4,877	486	10.0 : 1
East Africa <sup>2</sup> ... ..	133,321	5,120	26.0 : 1
South-West Africa ... ..	24,833	534	46.5 : 1
Total ... ..	5,694,701	2,151,309	2.6 : 1
South African War, 1899-1902 ... ..	404,126	21,292	18.9 : 1

<sup>1</sup> Indians excluded.

<sup>2</sup> For 1917 and 1918 only. Followers not included.

<sup>1</sup> " Final Address to the Officers of the Senior Division, Staff College," December 20, 1911. Published in the *Army Review*, vol. ii, 1912.

It is well known that a certain standard of equipment and personnel is laid down for medical units on mobilization, and that this proved suitable for European theatres of war. But the transport was absolutely out of place in the mountains of Macedonia, the roadless peninsula of Gallipoli, the bush of East Africa, the desert and rivers of Mesopotamia, the desert of Palestine, or the ice-bound wastes of Russia. Equipment and transport, therefore, require revision for campaigns in the East, for our experience in the Great War showed that cases of sickness far outnumber those of wounds in Eastern theatres of war.

### (3) FOLLOWERS.

Followers may seem to some an unimportant factor, but those who have served in the Near and Far East realize how essential they are. They are quaint people; they come from different nations and tribes, have different customs, eat different foods and speak different languages. Usually they drifted into a force; probably the medical authorities were never informed of their arrival, and often the force for which they worked did not know how to feed or clothe them, or interpret their wants. In East Africa, for example, hillmen were sent to swampy plains and died from malaria, while lowlanders were sent to the hills and died of pneumonia; it is little wonder that occasionally a scandal threatened. The sociology of the races that provide followers for a force is an important study, and one to which we should pay more attention if our Eastern armies are to be kept up to strength without extravagant expenditure in lives and money.

TABLE III.—ADMISSIONS TO HOSPITAL FOR SICKNESS AMONG BRITISH AND DOMINION TROOPS IN THE UNITED KINGDOM 1914-18.

Year		Average Ration Strength		Admissions to Hospital		Ratio per 1,000
1914 (August-December)	...	1,280,468	...	101,078	...	78.93
1915 ... ..	...	1,478,391*	...	417,137*	...	282.15
1916 ... ..	...	1,598,457	...	432,168	...	270.36
1917 ... ..	...	1,706,733	...	459,781	...	269.39
1918 ... ..	...	1,613,953	...	555,432	...	344.14
Average	...	1,535,600	...	393,119	...	256.00

\* British only.

Table III illustrates the strength by years of the troops serving in the United Kingdom during the Great War, and the ratio of sick admissions. It is very important to know the effect of billeting, training, rations and the military life in general on the health of the enlisted troops. The figures demonstrated how little sickness there was. In fact, the ratio of sick admissions for the past year was greater than the ratio in any year from 1914 to 1917. Even the ratio for 1918, in spite of the influenza epidemic, compares very favourably with post-war ratios. When people say we are a C 3 race I sometimes look at these figures and think that many do not realize that a man can do useful work although he does not come up to a certain physical standard. Hutchison supports this when

in a recent paper on prognosis in the *Lancet* he says : " Another source of error is the attaching of too much importance to physical signs and too little to the patient's general condition. This usually leads one to make too gloomy a forecast." We know that if officers at present serving were subjected to a thorough medical examination probably few would come up to what is officially the recognized standard. Yet they do good work. This is an important point to remember when considering the problems of man-power for any great war in the future.

TABLE IV.—APPROXIMATE TOTAL BATTLE CASUALTIES IN THE GREAT WAR, 1914-18.

Theatre of War	Killed	Wounded	Missing	P. of W.	Total	Died of Wounds
France ... ..	402,715	1,983,748	60,949	175,624	2,623,036	152,023
Italy ... ..	1,246	4,689	72	272	6,279	58
Macedonia ... ..	2,583	18,961	1,285	1,287	24,116	1,468
Dardanelles... ..	21,734	80,735	7,318	380	110,167	8,414
Egypt and Palestine	7,483	43,712	2,625	1,411	55,231	2,993
Mesopotamia ... ..	11,008	51,388	2,217	12,879	77,492	3,806
North Russia ... ..	327	486	125	45	983	33
East Africa ... ..	3,067*	9,110	1,459	477	14,113	754
West Africa ... ..	51	327	53	—	431	6
S.-W. and S. Africa	185	560	782	—	1,527	61
Aden ... ..	70	354	18	16	458	17
China ... ..	12	54	—	—	66	3
India ... ..	36	104	1	—	141	7
Somaliland ... ..	11	44	—	—	55	—
<b>Total</b> ... ..	<b>450,528</b>	<b>2,194,272</b>	<b>76,904</b>	<b>192,391</b>	<b>2,914,095</b>	<b>169,643</b>

\* Includes 376 followers unclassified.

TABLE IVA.—APPROXIMATE TOTAL BATTLE CASUALTIES IN THE GREAT WAR, 1914-18, AND AN ANALYSIS OF WOUNDED IN FRANCE.

Theatre of war	Killed	Wounded	Missing	P. of W.	Total	Died of Wounds
All Fronts ... ..	450,528	2,194,272	76,904	192,391	2,914,095	169,643
Western Front ... ..	402,715	1,983,748	60,949	175,624	2,623,036	152,023

*Analysis of Wounded in France.*

Total Wounded ... ..	...	...	...	...	...	1,983,748
Died of wounds ... ..	...	...	...	...	...	152,023
Wounded returned to duty:—						
(a) In France ... ..	...	...	...	...	552,468	1,602,033
(b) From U.K. (approx.)	...	...	...	...	1,049,565	
Percentage returned to duty	...	...	...	...	...	80.7
Wounded evacuated from France to United Kingdom	...	...	...	...	...	1,213,944

TABLE IVB.—EXPENDITURE BY THE STATE IN THE PAYMENT AND ADMINISTRATION OF PENSIONS.

	£
South African War (over a period of 12 years) ... ..	5,607,070
Great War, 1914-18 ... ..	665,000,000

Tables IV and IVA deal with the total battle casualties in the Great War and the number that occurred on the Western Front. As the latter represents approximately 90 per cent of the total, my analysis of the wounded, and later on of the sick, is confined to this campaign. The table shows the numbers killed in action, died of wounds, wounded, wounded returned to duty in the theatre of operations and from the United Kingdom, and the number evacuated to this country from France.

Apart from questions of general hygiene, the great objects of the medical service are to reduce the number of deaths from wounds, to shorten the



length of time in hospital and to increase the number of men returned to duty. That explains our almost unique position in a fighting force. We further the ideals of our profession by healing the sick and suffering, but we take an active part in the fighting by supplying reinforcements. Our main work is popularly associated with the seriously wounded who have to fight for their lives. Many do not realize that great surgical institutions were set up to deal with the permanently disabled, many of whom later become a justifiable expense to the State. A popular advertisement, for an ex-soldiers' association, and the total amount—£665,000,000—paid to date in pensions and in the administration of the Ministry of Pensions (Table IVB), are interesting in this connexion.

From the point of view of man power, the number of men returned to duty in the theatre of operations is all-important. Our ability to increase this number, to reduce the number of permanently disabled men, and to decrease the number of deaths from wounds depends upon two simple factors:—

- (1) Arrangements to collect cases with the least possible delay.
- (2) Proper provision for their reception, treatment and evacuation.

Unless we receive cases early they may suffer from sepsis, which prolongs their stay in hospital and delays their return to duty.

The principles of medical organization in the field are simple and easily understood, and if put into practice bring the following benefits:—

(1) Increased *morale* of an army, brought about by the knowledge among the men that when wounded they will be collected and cared for.

(2) Increased mobility of an army owing to proper evacuation of casualties.

(3) An early return to duty of trained men who have been slightly wounded, and so assist in the concentration of superior force.

(4) Saving in money to the State.

(5) Increased confidence among relatives at home.

In practice, when a battle is anticipated, certain obstacles immediately confront us and have to be overcome. They include:—

(1) Secrecy.

(2) The estimation of the probable number of casualties.

(3) Siting of medical units.

(4) The supply of extra units, personnel and transport.

The first three of these are "G" questions.

#### (1) SECRECY.

For some reason, G.O.C.'s and their general staff officers are diffident of trusting the medical staff officers. It should be clearly and definitely recognized that our ability to help them, their men and the State depends upon the information they give us. During the war relationship with the General Staff depended probably more on individual effort than on recognized policy.

## (2) ESTIMATION OF CASUALTIES.

I know well the difficulties encountered by the General Staff in estimating battle casualties, and their desire neither to voice their impressions nor to state where they expect casualties to be most numerous; but they are the only people who can give an estimate. We should be given this most important information, because the success of an operation may be influenced in no small measure by our knowledge of it.

## (3) SITING OF FRONT LINE UNITS.

We have hopes that a definite principle will be laid down on this point in the new edition of Field Service Regulations.

## (4) EXTRA UNITS AND PERSONNEL.

Field Service Regulations state "it is the duty of the A.G.'s branch of the staff to search for and collect the wounded after battle"; with this branch rests also the responsibility of providing extra units and extra bearers. Some staff officers think that our demands for extra units are haphazard, and that we ask too much, but it is our duty to keep before them the fact that our requirements are calculated on definite factors, such as estimated casualties from battle and sickness, rate of evacuation to lines of communication and overseas hospitals, plus a small percentage for "crisis" expansion.

## EXTRA TRANSPORT.

Extra transport is supplied by "Q" branch, who are responsible for preparing it for the conveyance of sick and wounded.

Sound knowledge of the elementary principles is of the utmost importance because the medical service first sent out with a force is constituted on very definite lines and can deal with only a certain number of casualties. Failure to appreciate the need for expansion usually leads to a breakdown in the medical arrangements, disorganization, and the evacuation overseas of trained soldiers suffering from slight disabilities, with a consequent loss to the Army and expense to the State.

I offer no apology for a simple statement of these facts and of our position, for, to quote Field-Marshal Sir William Robertson again, "if troops are not in their proper place at the appointed time, or are not complete, fully equipped and supplied in all respects as far as it is possible for them to be, the fault lies with the Staff."

Table V shows only the number of admissions, deaths, etc., for all causes except wounds on the Western Front. It is well known that in the prevention of disease in an army in the field we have played a great and important part; but have our scientists gone far enough? I feel that they

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<sup>1</sup> "Final Address to the Officers of the Senior Division, Staff College," December 20, 1911. Published in the *Army Review*, vol. ii, 1912.

have not. I think that this table shows that in congratulating ourselves on our preventive medicine we have maintained an unwarranted silence on the value of the practice of medicine and surgery and the allied special branches.

The success of our preventive measures is limited by our knowledge, and by the application of methods of prevention. It is difficult to progress without knowledge and for any serving officers to find time for research. Many advantages are derived from team work; I hope some day to see the scientists of all three Services working in unison under one roof.

TABLE V.—ANALYSIS OF ADMISSIONS FOR ALL CAUSES EXCEPT WOUNDS,  
WESTERN FRONT, 1914-18.

Total admissions	...	...	...	...	8,494,165
Total deaths	...	...	...	...	80,006
Total returned to duty	...	...	...	...	3,260,056
(a) In France	...	...	2,288,678		
(b) From U.K.	...	...	971,378 (approx.)		
Percentage returned to duty	...	...	...	93.3	
Total evacuated to United Kingdom	...	...	...	1,020,056	

Again, the other branches of the Army include in paper schemes definite medical proposals which are, nevertheless, difficult to apply when preparations for war are actually taking place. This has happened in all our campaigns, not only at the beginning, but even at the end of the war, and it happens also in peace time. For instance, take the Mesopotamian Campaign. Even in 1918 men were sent from the heated plains to the cold atmosphere of the Persian hills, clothed in khaki drill and with one blanket. No wonder a severe epidemic of virulent pneumonia ensued!

Again, fit and unfit men were sent to Mesopotamia from home without sun-helmets, glare-glasses or mosquito nets; in many cases it was only a matter of hours or days before they were shipped back to the United Kingdom.

In the East African campaign, according to experts, the incidence of primary locally acquired malaria would have been greatly lessened if the troops had not been disembarked and encamped on malarious sites.

Viewed in the light of experience, the valuable regulation that the officer commanding a unit or force is responsible for the sanitation of that unit or force is not enough. Among the greatest causes of sickness in the Mesopotamian Force were diarrhoea, colitis and dysentery. Comprehensive orders were constantly issued on the preventive measures required, yet when a force attacked and captured a Turkish position it usually encamped on that position, one of the foulest spots imaginable. The admission ratio for these diseases increased and finally became greater than that for battle casualties. I do not question the G.O.C.'s decision to encamp there. I only point out that we rested content with the decision, knowing what would happen, and are evidently content now to let the same thing happen again. It is too much to expect that tired troops who have marched and fought, gone hungry and thirsty over miles of desert, will set about making a camp sanitary after they have obtained their objective. There is one

way and one way only, and that is to hurry a fresh sanitary battalion to the site to make good the insanitary conditions. Some day this dream will be realized. Let those who scoff and cry "expense" think of Gallipoli, where at one time it was feared that forty-five per cent of the strength would be evacuated monthly. Surely if it is worth while training and transporting the flower of our manhood, it is only common sense to take every precaution to keep them fit.

It is by publishing such figures as these that should lead the responsible authorities to consider whether their force is complete in every way in the

TABLE VI.—CASUALTIES ON THE WESTERN FRONT, 1914-1918.

				Percentage of total casualties, excluding missing and prisoners of war.
Killed	...	...	...	6.85
Died of wounds	...	...	...	2.59
Died, other causes	...	...	...	0.51
Wounded	...	...	...	31.15
Sick	...	...	...	58.90
				<hr/> 100.00

TABLE VII.—WHAT THE MEDICAL SERVICE MEANT TO AN ARMY IN FRANCE.

Total wounded	...	...	...	...	1,983,748
Wounded returned to duty	...	...	...	...	1,602,033
				Percentage	80.7
Total sick	...	...	...	...	3,494,165
Sick returned to duty	...	...	...	...	3,260,056
				Percentage	93.8
Total sick and wounded returned to duty	...	...	...	...	4,862,089
i.e., a saving to the army in France of	...	...	...	...	16.8 armies *

\* Taking 288,236 as an average strength of an army.

fight against disease, and if not whether they might not save both men and money by making it so. Disease takes a greater toll of casualties than battle.

Times are changing and there is a tendency to forget or ignore the part we played in the fighting machine during the Great War. That tendency will grow if unchecked. It is therefore our plain duty to examine our training and teaching so that whatever happens we shall always be in a position to bring ease and comfort to the dying and suffering, to save men for the fighting forces, and to be worthy of our Corps, our Army and our Country.

## SOME NOTES ON MEDICAL STAFF TOURS.

BY COLONEL V. J. CRAWFORD, D.S.O.

A PERUSAL of the many staff tours that have been published in the Journal recently brings out very forcibly that there is a very great tendency for appreciations to become stereotyped and to deal with only one problem, the accommodation of the sick.

The general result is, that after writing about all the diseases which may arise, the officer estimates a heavy sickness rate resulting in large numbers of men to be accommodated, and then finding the number of beds provided below his requirements, he proceeds to ask for more; this procedure is not really dealing with the problem set, but is setting a fresh one.

If a combatant officer is given a problem and asked to appreciate the situation he does not start off by saying his troops are insufficient for the job. He makes a plan to deal with the actual situation, using his troops to the best advantage, so as to attain the object set in the problem.

It must not be thought that the question of the total accommodation provided for the sick and wounded is not of importance, but what I want to emphasize is, that there are many other problems which have to be considered, such as the situation of the medical units, the length of the lines of communication, the time it takes to evacuate the wounded from the front line to the base, and the maintenance of a reserve of empty beds.

The reason for the failure to study the particular problem is, I think, that while the military situation is generally quite clearly indicated the medical situation is frequently rather vague, and the officer called upon to write an appreciation does not know where he is to start, i.e., the troops are about to fight, but as far as the medical units are concerned they have not even been dispatched or unloaded from the transports. They exist only in imagination.

Let us just try to visualize what happens when a country decides to go to war.

Long before this event occurs the various heads of departments have been studying the problems and will have definitely decided upon some regular plan of action for every possible campaign, and there is no reason to suppose that the medical services will have been left out; they will certainly have considered the likelihood of various diseases arising and will have estimated the number of sick to be accommodated. The policy of retaining the sick and wounded in the area of operations, if overseas, or of evacuating them to the home territory, will have been discussed and settled by the War Office, and then the actual number of medical units to be dispatched with the Expeditionary Force will have been laid down.

On the outbreak of war, the D.M.S. of the force will be informed of the

policy as regards evacuation, the estimated sickness rate, and the various arrangements made to deal with it.

The problems that will then confront the D.M.S. are, the disposition of his medical units so as best to deal with the evacuation of the sick, taking into consideration the length and nature of the lines of communication and the number of trains at his disposal.

To illustrate my meaning the following situations are given and the actual medical details, with the nature of the problems required from the D.M.S., are laid down.

#### GENERAL IDEA.

"A" is a country whose land frontiers adjoin a powerful and well-organized military nation, "C." "A" is not strong enough to protect herself but has a defensive alliance with "B," a powerful naval power which has agreed to send a military force of three divisions to "A's" assistance should she be attacked. The distance between the shores of "A" and "B" is 300 miles. This general idea is common to all the situations.

#### SPECIAL IDEA, No. 1.

War has broken out and three divisions with the necessary line of communication troops are being dispatched commencing the ninth day of  $x$  month. A division complete with its proportion of line of communication troops embarking every two days. On disembarkation the division will proceed at once to the area of concentration, 100 miles from the base.

The narrative must contain a clear statement of the policy, the estimated daily rate of sickness and a full and complete list of all the medical units that are being sent with the force. The division should always be considered as being complete with field ambulances and sanitary sections. Any additional field ambulances should be included in the list of medical units.

*Problem.*—As D.M.S. you have arrived in advance on the fifth day of  $x$  month. Write an appreciation of the situation.

In such a situation the D.M.S. would discuss:—

- (1) The topography of the country as regards the roads, railways and waterways of his particular lines of communication.
- (2) The numbers for evacuation based on the estimated daily rate of sickness.

And his plan of action would show his proposed siting of all the medical units so as to deal with the daily casualties in the best manner possible and still have room to provide for the casualties of a general engagement.

#### SPECIAL IDEA, No. 2.

The three divisions have arrived at the area of concentration and after a halt of one week a further advance is anticipated. The enemy are still fifty miles distant. The G.O.C. intends to hold a conference to-morrow to discuss the arrangements for the advance.

The narrative should contain a definite statement as to the situation of the medical units, number of hospitals open, number closed, &c., position of C.C.S.'s., M.A.C.'s., and ambulance trains. The number of sick actually in hospital and the daily rate of sickness.

*Problem.*—As D.M.S. of the force write an appreciation of the situation.

The important point is the arrangements for the evacuation of sick from the advancing army and concerns the movements of the casualty clearing stations and the arrangements for evacuating the sick so as to permit them to move.

### SPECIAL IDEA, No. 3.

The forces are actually in contact, a battle is expected at zero hour on twenty-fourth day of  $x$  month, the G.O.C. is having a conference at 12 hours on twenty-second day of  $x$  month to discuss the arrangements.

The narrative should contain definite details as to the present sites of all medical units, the number of sick in the various units, the nature of the fighting expected.

*Problem.*—As D.M.S. write an appreciation of the situation.

What is now required are the medical arrangements for a battle which include the evacuation of all sick to the base, the provision of sufficient beds to accommodate the expected casualties, the arrangements for evacuation of casualties from divisional field ambulances through casualty clearing stations to the base, the quantities of medical material, i.e., stretchers, blankets, dressings and splints required to be provided and the arrangements for their replenishment.

There are many other situations which might be given, but enough has been written to show what is meant. The important point is, that a very definite situation as far as medical details are concerned should be given, and also a definite time and date on which to appreciate the situation.

It may be thought that the above ideas necessitate some change in the generally accepted methods of writing an appreciation. This is not so, though they should certainly simplify the task.

My own conception of how to write an appreciation is as follows :—

In the first place it should be realized that an appreciation is written for the information of the G.O.C., that it should be short, clear, and definite, it should contain only sufficient data to show the grounds on which the plan for dealing with the sick is made. As a rule an alternative proposal should be submitted and the points for and against each proposal definitely stated, with the reasons for adopting the selected plan. The plan itself should be so definite that the other branches of the staff can take the necessary action to have it carried out.

The headings of the appreciation should be as follows :—

(1) The position and relative strength of the opposing forces.

The principal point here is the numbers and possibly the nature of

the weapons, so as to be able to calculate the daily numbers for evacuation and the casualties in an action.

(2) The object to be attained.

This is generally given in the Special Idea and is only required from the medical point of view to determine the policy of evacuation ; for instance, if a delaying action with a possibility of retreat is contemplated, medical units must be situated far back. But as far as the medical services are concerned their *special object* is always the same, namely, the evacuation of the sick and wounded, and this is the main theme of an appreciation.

(3) Factors which may influence the attainment of the object.

(a) Topography: Railways, roads and waterways, with special reference to the facilities and the length of the lines of communication.

(b) The numbers of sick and wounded to be evacuated:—

(i) Daily.

(ii) After a battle.

(c) The accommodation provided and the steps to be taken to maintain the empty beds to provide for casualties after a battle, use of hospital ships and ambulance transport.

(d) The amount of transport, M.A.C. and ambulance trains.

(e) Formation of dumps of stretchers, etc.

(4) *The Courses Open.*

Discuss the various arrangements for evacuation of sick and wounded by road, rail and water, the siting of casualty clearing stations and hospitals at advanced main bases, with the advantages and disadvantages of each.

(5) *The Plan of Action.*

Here state definitely exactly what you intend to do.

The appreciation having been written (of course it should have the proper headings, place, time, date, etc.), what does the G.O.C. do with it? He will probably turn to the last page, and if he agrees with the plan he will pass it to his staff to arrange for it to be carried out. He may possibly read the rest to see how you have arrived at your decision, he certainly will do so should there appear to be any difficulty about carrying out your suggestions or if they do not fit in with his own battle plans, then if he decides your plan is satisfactory and there is no other alternative, the staff will issue the necessary orders. You would probably be called in to discuss matters with a view to modification of minor details.

A realization of what is done with an appreciation in actual practice will, I think, help officers in understanding what is really wanted.



## "THE PASSING OF THE MILITARY HOSPITAL, DEVONPORT."

BY LIEUT. COLONEL C. R. SYLVESTER BRADLEY.

*Royal Army Medical Corps.*

ON December 15, 1926, the Military Hospital, Devonport, closed its doors. In future any soldiers requiring hospital treatment will be sent to the Royal Naval Hospital, Stonehouse.

Such is the inglorious end of a hospital which even so late as 1860 was reported on as being "The best and most commodious of the Military Hospitals."

The early history of the hospital is somewhat obscure, but there can be little doubt that part of the present stone building was erected in 1797. Sergt.-Major A. J. Milne, late R.S.M., No. 7 Company, discovered a small book published in 1872 entitled "The Picture of Plymouth," giving the following description of the hospital:—



Royal Military Hospital, Devonport.

"The Military Hospital is close by the church, and immediately opposite the Naval Hospital, and was built in 1797. It consists of four distinct buildings, connected by a piazza, which projects in front of them, so as to form a terrace immediately on the outside of the windows of the wards, admitting convalescents as soon as they can quit their beds, without experiencing the fatigue of ascending and descending the stairs, to walk on a delightful terrace, and enjoy the fine sea air and exercise. The wards are very lofty, well ventilated, and commodiously fitted up, and the whole building and its furniture well guarded against fire. There is no permanent establishment here now, it having been deemed an unnecessary expense, as these buildings

are used only occasionally except by the sick of the regiments at the Dock who are attended by their regimental surgeons. This retrenchment may be a very proper saving, but it should be remembered, when opportunities occur in which these buildings are used, otherwise the men sent here may suffer extremely from the want of nurses and attendants, which is not averted to in a moment of hurry and confusion. This hospital was erected soon after Admiral Christian's fleet was detained at Plymouth, with some regiments on board transports for the West Indies, during which a contagious fever broke out amongst the troops and carried off great numbers of them. The advantage of possessing such a building was fully experienced on the arrival of the troops from Corunna, when 500 men and upwards were immediately received here, and though this was one-quarter part of the sick, yet it was a great object to have a building that could receive even those, and the money expended in the erection of it was proved to have been well laid out."

It should be noted that the Military Hospital is in the parish of Stoke, and that at the time the above was written the present town of Devonport was known as "Plymouth Dock." On the petition of the inhabitants the name was changed to Devonport in 1829.

A local directory of 1820 further states in dealing with this hospital, "There is another hospital near the West Barrier Gate, Fore Street, for the reception of sick in the Engineer and Artillery camps, replete with every convenience."

Later historians of Devonport would appear to have been content with repeating the information contained in "The Picture of Plymouth." One further small item of interest is, however, contained in Worth's handbook of Devonport, which gives an account of a murder committed by the wall of Stoke Church (near the present entrance gate). It relates how the murderers were hung in chains on a gibbet erected by the corner of the Military Hospital wall (near the present expense store accountant's office), by the "Lakeside." The body of Smith, one of the murderers, hung for several years, then fell, and was buried near the gibbet. In 1827 the gibbet was cut down and made into *snuff boxes*.

The first official report on the hospital I have been able to obtain is dated 1860, by "T. G. Logan, M.D., Inspector General of Hospitals, and head of the Sanitary Branch"; it reads as follows:—

"The hospital accommodation for the united garrison of Devonport and Plymouth is at Stoke—a locality between the towns. The buildings form a general hospital, but in which the sick have continued to be treated regimentally. Four large pavilions of three storeys each, with a traversing colonnade in front, compose the range. In many respects it is to be looked upon as the best and most commodious of the military hospitals of its day, but one singularly misplaced in a sanitary point of view, lying low and on the margin of a creek surface on the recess of tide. In this respect the situation is most faulty, and often the cause of much that is disagreeable

through offensive emanations in hot weather. For this evil the only remedy would be embankment to the low-water level—an unfeasible measure of expense in every probability, as it would require co-operation of the kind from other local and neighbouring interests.

"In propinquity to its rear boundary wall, too (a public right of pathway only intervening), the parish burial ground of Stoke, now old and replete, would appear not to have weighed in the sanitary scale at the era of selection.

"This large hospital is understood to have been built for the exigencies of the *great war*; and, in the selection of site, convenience must have been studied more than sanitary advantage. Invalids and wounded, disembarking from ships anchoring in the Sound, could be conveyed in boats direct up the estuary to the hospital jetty. Notwithstanding the twofold evil, no prejudicial influences in regard to the sick are brought forward, and it has been generally experienced that the hospital is not otherwise than conducive to their recovery.

"The wards are large and lofty, their ventilation has been improved by the introduction of the system of the Barrack and Hospital Commission and the fittings of the new ventilating grates, upon which one of the medical officers in charge reports that 'he has found far less difficulty in keeping an equable temperature and pure air than under the old system.'

"The buildings in occupation are lighted with gas, and the staircases are warmed with a large patent Nettleton stove in each passage."

At first sight it appears a little strange that "Inspector-General" Logan was unable to obtain more definite information as to the date when the hospital was built, and his allusion to the "*great war*" is interesting if not very instructive in these days; presumably he was referring to the Peninsular War.

In 1869 a proposal to wash dirty barrack linen in the hospital laundry and "to dry the wet barrack bedding in the hospital ground" was only prevented after very strong representation by the P.M.O., on the grounds that the proposal would be "productive of noise, disorder, dirt and stench, and would interfere with the hospital economy, which has for its ultimate object, not the establishment for trade or business, but the welfare of the sick."

In 1872 enteric fever was more or less prevalent in Devonport and Deputy Inspector-General Munro, C.B., in his sanitary report, has some rather scathing remarks on the sanitation of the hospital. After condemning the general drainage system, he goes on to say:—

"The sanitary condition of the General Hospital, Stoke, I consider imperfect, and much is required to make it comfortable. The water tanks within the building are not covered over, and in more than one part of the building these tanks are under water-closets and bath rooms; though there may never be any leakage from the water-closet pans or escape pipes, still such a thing is possible, and whenever the seat and floor of the closet is

washed the water used for this purpose may (and does I am told) drip into the tank below."

In 1897 we read again that "the drainage system is still under reconstruction, having been found very defective." In this same year, 1897, the new block, presumably the present administrative or "E" block was completed and handed over; this contained "four general wards of sixteen beds each, with special ward, recreation rooms and duty rooms for nursing sisters and orderlies."

It was not until 1899 that hot water was laid on to the bath-rooms, and in this year great things were done, for the redrainage of "A," "B" and "C" blocks was completed; this apparently had been faulty since 1872.

During and after the South African War the hospital must have been thoroughly modernized, and a number of wooden huts were erected in the hospital grounds for the accommodation of patients. In 1902 a scheme was put forward "for utilizing these huts as barrack rooms, canteen, sergeants' mess, bacteriological laboratory, etc."; further the report states, "If this is adopted the hospital will then be all that could be desired."

This proposal was carried out apparently without modification and in all probability was a contributory cause to the closing of the hospital, a quarter of a century later.

During the Great War, 1914 to 1920, the hospital often accommodated more than 500 patients, but in recent years the number of equipped beds had been gradually reduced, until in 1925 only 105 remained, and although this number proved to be insufficient during epidemics of influenza, the average number of occupied beds in normal times was not more than seventy to eighty.

Of the many distinguished members of the Corps who have served at Devonport perhaps the best known are two of our late Directors-General, Sir Arthur Sloggett and Sir John Goodwin, but certainly the most picturesque personality is that of Surgeon-General Evatt, who took an inordinate pride in the Devonport Military Hospital, and of whose quaint unorthodox methods of training so many stories have been told.

It would be quite out of place for me to question the policy which led to the closing of this and another large military hospital, but as the last Commanding Officer of the Military Hospital, Devonport, I can only say with what deep feeling and regret it has been my painful duty to destroy what may be regarded as one of the milestones in the progress of the Corps. The Military Hospital, Devonport, has passed away, but for those who have served or been treated within its grey stone walls a tender memory will always remain.

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NOTES ON WRITING THE MEDICAL APPRECIATION REQUIRED FROM MAJORS OF THE ROYAL ARMY MEDICAL CORPS IN THE PROMOTION EXAMINATION IN SUBJECT  
(h) PART II.

By A STAFF OFFICER.

(1) TRAINING and Manœuvre Regulations, 1923, sec. 25, para. 4 (as amended by Army Order 117 of 1926) state:—

“The writing of appreciations in the accepted logical sequence is a necessity. The general headings and the necessary sequence are:—

- (i) Object.
- (ii) Considerations which affect the attainment of this object.
- (iii) Courses open to both sides.
- (iv) Plan.

Unless the object is clearly stated in the opening paragraph, the appreciation is apt to become involved, and the decision—which is the aim and object of all appreciations—shrouded in doubt.

From the plan, as given in the final paragraph, any staff officer should be able to write the necessary orders.”

(2) It is assumed that the situation set for appreciation in the examination is one which would arise at the commencement of a campaign, in which a striking force of approximately a division and a cavalry brigade is quickly mobilized for operations. The candidate is placed in the position of A.D.M.S. of the striking force and is asked to write an appreciation of the situation from its medical and hygienic aspect.

(3) It is suggested that the required appreciation might take the following form:—

*Para. 1—Object.*

(a) The preservation of the health of the troops and the prevention of disease.

(b) The rapid evacuation of sick and wounded from the area of operations.

*Notes.*—It is considered that the above clearly expresses the main object of the A.D.M.S. at the commencement of the campaign, i.e., to maintain health, minimize disease, and clear his area of casualties. This object must be borne in mind throughout the writing of the appreciation.

*Para. 2.—Considerations which affect the attainment of this object.*

(a) *Topographical and Climatic Considerations.*—Consider the effect of the country and climate on the health of the troops, nature of water supply, communications available for evacuation, etc.

(b) *Nature of the Operations.*—Consider effect on health of troops of rapid advance, long marches, bivouacs at night, etc.

(c) *Prevalent Diseases*.—Consider time of year at which operations commence and the diseases most likely to attack the troops.

(d) *Nature of Casualties*.—Consider casualties from aircraft and from gas.

(e) *Estimate of Casualties, Sick and Wounded*.—Calculations should be shown in an appendix and the conclusion embodied in the appreciation.

(f) *Resources available for Evacuation of Casualties*.—Whether these are sufficient, or what increases are necessary.

Other considerations may also arise which will affect the attainment of the object. But it is not considered necessary to repeat in the appreciation the information given in the scheme regarding the disposition of our own and the enemy forces, except in so far as these dispositions may affect the medical problem.

The third heading given in T. and M. Regulations, viz., "Courses open to both sides," has no bearing on the medical appreciation and may be omitted.

#### *Para. 3.—Plan.*

(a) Measures for preserving the health of the troops and for preventing disease.

(b) Measures for evacuation of casualties from the area of operations of the Force.

*Notes*.—T. and M. Regulations, sec. 25, para. 9, states: "The plan of action should be definite, clear and practical. It should be stated concisely, but in sufficient detail for a trained staff officer to be able to draft the orders required to carry it out."

In an appreciation of this nature the plan would contain the measures recommended by the A.D.M.S. for attaining his object. These measures, if approved by the G.O.C., would be made known to those concerned by means of orders issued by the staff.

Under (a) above would be included all sanitary and hygienic measures to be taken to preserve health, e.g., recommendations regarding water supply, its purification and safeguarding, also supplies which may be procured locally, such as milk, fruit and vegetables; any special measures recommended for disposal of excreta, refuse, etc., any special precautions necessary to prevent contamination of food by flies; precautions to be taken to combat prevalent diseases; recommendations regarding washing and disinfection of clothing, etc.

Under (b) above would be included the A.D.M.S.'s general plan for the evacuation of casualties from his area, based on the medical resources at his disposal and the communications available in the area of operations. The plan should show his medical dispositions in the concentration area, and his forecast for future operations.

## NOTE ON THE AGGLUTINOGENIC PROPERTIES OF WASHINGS OF CULTURES OF *BACILLUS TYPHOSUS*.

BY MAJOR C. D. M. BUCKLEY, M.C.

*Royal Army Medical College.*

ATTENTION has recently been drawn by Horder and Ferris (*British Medical Journal*, July 31, 1926) to the antigenic properties of the apparently bacteria-free washings of cultures of various organisms. Owing to the wide variation in response to immunizing inoculations among individual experimental animals, it is unsafe to draw conclusions from a limited number of experiments, and the following particulars are published with a view to adding to existing data in the hope that they may prove useful to other investigators.

*B. typhosus* was selected for these experiments, and an attempt was made to compare the agglutinating powers of the serum of rabbits inoculated with the clear centrifugate from saline suspensions of the organism with that produced by inoculations of the whole suspension and also of the bacterial sediment after washing.

A subculture from a strain with a known good agglutinogenic power was grown on agar for twenty-four hours; the growth was then washed off with normal saline solution and standardized so that 1 cubic centimetre contained 2,000 million organisms. A part of this was kept as ordinary vaccine and the remainder was immediately centrifugalized in a high power centrifuge. The clear supernatant fluid was then removed with a pipette. When examined under the microscope with direct and dark-ground illumination it was seen to contain a few scattered bacilli and some minute granules. The deposit of bacteria was made up to its original volume with normal saline. Each of these three antigenic fluids was then carbolyzed with 0.5 per cent. carbolic.

Each rabbit was given an initial dose of 0.1 cubic centimetre, which was increased at five-day intervals until a maximum of 1 cubic centimetre was reached. The following tables show the agglutination titres of the sera of the rabbits immunized with the various types of antigen.

### (1) WHOLE SUSPENSION. 2,000 MILLION STRENGTH.

Rabbit	Agglutination titres			
	5 days	10 days	15 days	20 days
No.				
1	1/250	1/12,500	1/12,500	1/21,000
2	1/500	1/5,000	1/12,500	1/21,000
*3	1/500	1/12,500	—	—

\* This rabbit died on the seventeenth day from an abscess which was found to contain *B. typhosus*.

(2) CENTRIFUGATE.

Rabbit	Agglutination titres			
No.	5 days	10 days	15 days	20 days
4	1/1,250	1/12,500	1/25,000	1/18,000
5	Nil	1/1,250	1/5,000	1/14,000
6	1/500	1/12,500	1/25,000	1/21,000

(3) SEDIMENT.

Rabbit	Agglutination titres			
No.	5 days	days	15 days	20 days
7	1/250	1/5,000	1/12,500	1/28,000
8	1/125	1/5,000	1/12,500	1/27,000
9	1/250	1/5,000	1/12,500	1/21,000

The above results show no material difference in the agglutinogenic properties of the whole suspension and its two moieties each administered separately. As it was suggested that the apparent anomaly might be explained on the assumption that in each case the quantity of antigen injected was more than sufficient to produce a maximal response, a further series of experiments was carried out with smaller doses, actually one in ten dilutions of the original antigens.

(4) WHOLE SUSPENSION. 200 MILLION STRENGTH.

Rabbit	Agglutination titres			
No.	5 days	10 days	15 days	20 days
13	1/50	1/500	1/2,500	1/2,500
14	1/125	1/500	1/1,250	1/2,500
15	1/250	1/500	1/500	1/1,250

(5) CENTRIFUGATE.

Rabbit	Agglutination titres			
No.	5 days	10 days	15 days	20 days
16	1/125	1/500	1/500	1/2,500
17	1/25	1/50	1/500	1/1,250
18	1/250	1/500	1/2,500	—

(6) SEDIMENT.

Rabbit	Agglutination titres			
No.	5 days	10 days	15 days	20 days
19	Nil	Nil	1/500	1/2,500
20	1/25	1/125	1/500	1/2,500
21	Nil	1/250	1/1,250	1/2,500

In this series the actual titres attained were inferior to those reached in the first series, but there was still no appreciable difference between the three antigens.

It is noteworthy that three other rabbits inoculated with the centrifugate after filtration through a cellulose-asbestos filter failed to show any signs of agglutinin production.



# "POSSESSED."

BY COLONEL FRED SMITH, C.M.G., D.S.O. (RET.).

WILSON was languidly looking out on the monotonous landscape in front of his mud-hut after breakfast, while his companion, Brown of the Waffs, lay in a long chair and discoursed between puffs of his cigarette on the rottenness of life in the bush. Suddenly he caught sight of half a dozen of Brown's company, bringing along by "frog's march" a struggling comrade.

"My God! blind drunk at this time of day and his pals running him in. This is indeed strange, Brown." It seemed stranger still when the drunken man was dumped on the ground at the door of the hut.

"It's Braima Timini, sir. Him not drunk, sir. Debil done get him," cried the spokesman of the party, noticing the doctor's look of inquiry.

Braima, taking no interest in the proceedings, was writhing about, belching almost continually and groaning between belches.

"Well, I'm damned," said Brown, helpfully, as he stood up and peered over the parapet of the verandah. "Bedad an' he's drunk wid onions anyway."

Wilson was thinking furiously and looking as solemn as an owl, while he separated the man's eyelids and felt his pulse with some difficulty, the Waffs looking on hopefully.

"Onions, me boy," continued Brown with a grin, as a pronounced odour diffused around.

"Oh, shut up, it's garlic."

Belching? Garlic? The words were humming through Wilson's head. He had never seen a case like the one before him. But he was searching in the back of his mind, where there was a dim remembrance from student days of a garlicky smell being a characteristic symptom of some form of poisoning. He rose from the ground, looked hard at Brown. "By God, I have it—it's phosphorus."

"Sure, its sulphur you're thinking of and that's the smell of the devil," said Brown, who treated the most serious situations in a jocular way.

Wilson went off with the victim to the little hut which constituted the hospital. Brown by way of a parting shot called out, "It's sending to the Mission Station for a padre you should be, me lad. He'd cast the ould-un out of him." Withal, being a good-hearted soul and useful in emergency in spite of his sometimes irritating facetiousness, he soon followed the party to the hospital, to see if he could be of any use. He would have said, "I'll cheer the devils up, anyway."

Wilson, delighted to have something on which to exercise his faculties as a disciple of Sherlock Holmes, set himself to work on the problem before

him. Whence came the phosphorus with which poor Braima had undoubtedly been poisoned. It seemed almost absurd to think of such a substance as obtainable in an out-of-the-way bush station.

In a couple of days Braima had recovered sufficiently to submit to oral examination. He himself was satisfied that a devil had possessed him and was disinclined to discuss the subject. He feared, no doubt, to offend the said devil, lest he should get further attention from that malignant sprite.

Moreover, Braima's knowledge of English was confined mainly to military terms, and he evidently mistrusted the interpreter who was called in. It was important not to alarm him or any of his friends by too direct questioning, so all that Wilson gathered for the moment, bearing on the matter in hand, was that he lived in the native village with his wife who prepared and shared his meals.

Wilson managed to interview the wife—ostensibly to inform her of her husband's condition. He was impressed by the fact that Mrs. Braima proved to be an attractive young woman, not at all shy and rather superior as things went in Giomo. The wily Wilson beamed on her. She responded and became archly loquacious, but gave no sign of knowing anything of her husband's devil. She said she had no idea why the evil spirit had got hold of him.

One thing was obvious—Braima's wife was not grieving over her man—her lawful man. Wilson surmised the existence of a third party.

Cautious inquiry brought on the scene one Mahomet Foulah, as a one-time friend, with whom Braima had not long ago quarrelled.

Scent was getting hot. Sherlock Wilson returned to Braima, by this time well, through an intermediary—his orderly—who was also a friend of the victim of sorcery.

Now some really useful information was obtained. The orderly, in friendly chat with Braima, ascertained that he had made it up with Mahomet—that the latter had met him after dark as he was on the way home, and had said, "Why should we be enemies? Let us make it up and be friends as we were before. Here is a kola nut which I have divided. Let us each take half and eat it, to seal our friendship."

The simple Braima agreed, and ate half of his portion on retiring to bed with the wife of his bosom. But he woke in the night, feeling unwell. He wondered what had come over him. His affectionate partner smoothed his fevered brow and said innocently, "Perhaps if you took the rest of the nut you would feel better." Her husband acted on the advice, but did not experience any improvement in his condition. On the contrary, he felt a good deal worse and began to think it was all up with him.

Braima being absent from parade, his pals came to look for him, and brought him before the doctor, as already stated.

Wilson jumped for joy, so to speak, internally, at the conclusion of the story, though he "kept on saying nuffin."

Sharing the kola was not unusual. Yet obviously the custom lent itself to crime. Withal why phosphorus and whence phosphorus?

For a few days progress was at a standstill with the amateur detective. It was the flippant Brown who unconsciously gave him an idea when he remarked, "What's the use of worrying yourself silly over these natives and their tricks? Much better come out with me to shoot bush-fowl. Let 'em put medicine on each other if they want to. There are lots of things in the world that you and I don't understand. The medicine man'll be putting it across *you*, me lad, if you're not careful."

"Don't be a superstitious ass," was the reply. Wilson had not been long out and knew little about necromancy. Brown's words had started an idea. He must investigate the subject of native "medicine."

Sending for the leading man of the party which had brought up Braima when he was taken ill, Wilson upset him by requesting to be shown the house of the village medicine-man. Evidently frightened, the trembling fellow conducted the officer to within seeing distance of the house of magic and pointed it out. When asked to go on to the door and summon the occupier he expressed his fear.

"What ting fright you," said Wilson, approximating his speech, as was sometimes his way, to the broken English current in the country. They responded, better, he thought, to their own form of our language.

"All dis country man 'fraid for medicine-man"—a pause, and the man continued—"Mahomet Foulah—'im only not 'fraid too much—'im come from far."

"How you sabbey dat?"

"I seen 'im come out de 'ouse one night—'im axe me matches."

"Yes."

"'Im go na 'ouse agin. Me, I done go away one time. Den 'e come to me deah na barrick an' gie me back me matches. 'E say dem no good—'Im want de red match. 'E gie me money an' I buy um na red match na canteen. Den 'im go away."

"Where to?"

"Dat me no sabbey for true, sah. Specs 'e done go back de medicine-man."

"What for 'e no buy de matches hisself?"

"'E say he get business wie a man in de nex' barrick."

The secret was out. The case now seemed clear as daylight. At Wilson's instigation Mahomet Foulah and Braima's wife were clapped into the respective parts of the gaol suitable to their kind and they were cut off from communication with each other or with the outside world. A strict watch was kept on the wizard. Braima was retained in hospital for safety and seclusion.

When all the details of the affair were being rolled out in damning sequence before Major Farland, the District Commissioner, in the local court house, Mahomet Foulah looked amazed. Soon the prisoner became so alarmed that he reversed his plea of not guilty and confessed everything he knew.

Braima's smiling wife Tiesa had added gall to the cup. She was decorated in her best, wearing shining silver on her beautiful neck, arms and ankles, gracefully swathed in crimson silky material, her neat little head coquettishly bound up with a dark green silk kerchief—all in harmony with her smooth brown skin—she made a striking impression on the court. When asked to plead she seemed quite unable to comprehend. After much explanatory effort on the part of the polite District Commissioner and elaborations much more bluntly put by the coloured interpreter she said:—

"Mastah, I don't know anything. My father Creole man. They born me in Mission. I no savvy these people. I dunno why my man get a devil. I savvy this man want me, that man want me. Them fight for me. All same I keep my man—that no more. God make me so men like me—that not my fault, Mastah. Too plenty men wanting me."

As Tiesa sort of wreathed a bewitching smile over the gallant Major's countenance, he felt that he was bound to agree with her. He remarked in a low tone to Brown, who sat by him watching the case for the Waffs:—

"Not so innocent as she looks, Brown, what? Didn't know there was anything so dainty in the country. She's distracting the court. I must get her evidence quickly and send her down for the present."

"Indeed, yes," said Brown. "There'll be a riot soon if ye don't—and ye'll never get through with the business. Something wrong about her or she'd never have tied herself up with a fathead like Braima Timini."

So Tiesa, after she had artlessly given away what little she knew of the affair, was removed. She smiled at the District Commissioner and tinkled out a "Thank you, sah," as she gracefully flowed out between two policemen.

Mahomet now pleaded that he only wanted the medicine-man to make Braima less competent as a husband—a clever plea enough in mitigation of his crime. Incidentally it may be remarked, however, that subsequent events showed that, if Mahomet spoke the truth, the magician had not successfully carried out his contract.

So, there was now enough ground for taking the extreme course of arresting the medicine man himself. Mahomet gave evidence against him in the hope of getting a light sentence for himself. But he had nothing to say about poison. All he knew was that he had paid for the bewitching of Braima.

It was Wilson who had to describe how the heads of the matches could be ground into paste and insinuated into cracks and spread on the broken surface of the nut. As the white interior of the kola nut turns red on exposure to the air, the addition would not attract attention, especially at night. Such artificial light as there might be in the Braima home would be of the feeblest character. All the natives thought Wilson was talking nonsense, though they admitted his skill in detecting the guilty parties.

The District Commissioner, in the course of pronouncing a high-falutin discourse in court, before giving sentence, on the tricks of witch-doctors

and the folly of trusting to these impostors, brought a becoming blush to Wilson's cheeks.

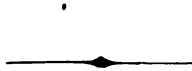
"Behold," cried the law-giver, standing up before the assembled crowd of awe-struck natives, and waving his right hand dramatically towards the embarrassed Wilson. "Behold a great white medicine-man who knows more than all the black ones put together. He sabby all ting." Much more he said on the same theme, and the interpreter repeated it in the language of the people for the benefit of those who understood not the conqueror's tongue.

The little wife was let off with a "caution." Needless to say, the medicine-man got a much bigger sentence than Mahomet.

After that great trial the people who had been on cordial terms with Wilson, whom they called "the white doctor," began to slide off when they saw him coming. They thought he could see into their hearts, and they were most of them sinners.

"Begorrah," said Brown, by way of cheering him up a bit, "you'll need to go 'soffulo' or the medicine-man's pals will get you all right. If they don't you'd better clear out of this before that cove comes out of gaol."

It was long ere the natives recovered confidence in their doctor and of course they believe as firmly as ever in witchcraft.



## Editorial.

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### THE RELATION OF MEDITERRANEAN FEVER TO CONTAGIOUS ABORTION IN CATTLE.

CONTAGIOUS abortion of cows is a highly infectious disease which has been known for some years. In 1896 Bang and Stribolt isolated the causative organism, *Bacillus abortus*, and produced abortion by injecting pure cultures into the vagina of pregnant cows. Injections into the general circulation produced similar results. McFadyean and Stockman showed that pregnant cows could be infected by feeding upon infective material, either artificial cultures or natural exudates from infected animals.

The infected cow usually aborts from the fifth to seventh month of pregnancy; its general health is not much affected; the pathological changes are confined to the uterus and its contents. In apparently healthy animals the udders may be heavily infected without harm to the cow until it becomes pregnant, when bacilli may find their way to the uterus. There are no definite premonitory symptoms; if the cow is in milk the secretion is often diminished and in certain cases may resemble colostrum. The mortality from the disease is practically *nil*, but the animal either remains sterile, or repeatedly aborts soon after service—generally within two months. Antibodies, such as agglutinins, can be demonstrated in the blood and in the milk. The vaginal discharge which appears immediately before and during parturition shows numerous small bacilli, either free or heaped together in clumps.

Although the *B. abortus* occurs more frequently in cattle than in any other species of domestic animal, it has been recovered from sheep, horses and swine. Extensive outbreaks of abortion in swine due to the *B. abortus* have been reported. The porcine strains are stated to grow readily on nutrient agar, without any sealing of the tubes or increase of CO<sub>2</sub>. They are also said to be more virulent for guinea-pigs than the bovine strains.

The interest of contagious abortion lies in the close resemblance of the *B. abortus* to the *Micrococcus melitensis*, and in the fact that cases of undulant fever have been attributed to the consumption of milk containing the *B. abortus*, and have sometimes appeared among the workers on farms where contagious abortion in cattle has occurred.

In 1918 A. C. Evans compared the *B. abortus* with the organism which causes Malta fever. She described the *B. abortus* as a short slender pleomorphic rod with rounded ends, whose form is influenced by the medium in which it is grown. The cells are sometimes so short as to appear coccoid. The bacillus stains readily with ordinary dyes, but is decolorized by Gram. Miss Evans maintains that *M. melitensis* has a rod form, and

the drawings she gives in her paper of the *B. abortus* and *B. melitensis*, stained by Gram but not decolorised and magnified 4,800 diameters, show marked bacillary forms in the case of both organisms.

It is difficult to get a first growth of *B. abortus* from pathological material, but growth is favoured by a reduction in oxygen tension, or rather it is now thought by an increase of  $\text{CO}_2$ . When a strain has become accustomed to artificial conditions growth is abundant on ordinary media. On agar it forms a lustrous moist growth with sharply defined margins, and crystals form in the medium after five or six days' growth. In agar shake cultures there is an abundant surface growth, but no growth beneath the surface. On agar plates tiny dewdrops appear which gradually become opaque. It produces a faint clouding in broth, but there is no surface ring or pellicle. It causes a slight alkalinity in milk; the reaction never becomes pronounced. On potato there is a glistening growth of a brownish colour. It does not ferment any sugars. In broth cultures there is a reduction of the hydrogen-ion concentration equal to about 0.7 or 0.8 pH. This reaction is fairly definite and characteristic, and the original hydrogen-ion concentration may vary over a wide range in either direction from the neutral point without affecting the results. Urea and asparagin are decomposed with production of ammonia, but this reaction is often slight. Some cultures cause a slight reduction of nitrates to nitrites, others do not. Indol is not produced in a tryptophan medium. Miss Evans stated that on comparing the cultural characteristics of *B. abortus* and *M. melitensis*, the only difference observed was a more intense brown pigmentation produced by *M. melitensis*—an insignificant characteristic which did not appear until the cultures had been incubated for a week or more. Many other workers in England, France, Italy, Germany, and the Colonies, have failed to find any definite cultural differences between the two organisms.

Meyer and Shaw state that *B. abortus* and the *M. melitensis* cannot be distinguished morphologically or biochemically. They say that in young cultures the *M. melitensis* appears as a short rod, and it should be called the *Bacterium melitensis*. They consider that the peculiar adaptation of the *B. abortus* when first isolated, to varying oxygen tensions is probably related to its intra-uterine existence.

Nicolle, Burnett and Corneil found the *B. abortus* on injection was not pathogenic to man, and in this respect differed from the *M. melitensis*. Some Italian observers record cultural, biological and chemical differences between the two organisms, but Favielli, in Florence, could not distinguish between them; he thought the differences were too slight to be of any diagnostic value.

Beguet studied forty-two strains of *M. melitensis*, *M. para-melitensis*, and the *B. abortus*, and was unable to differentiate between them. Vercellaria and Zanzacchi thought they could distinguish the *M. melitensis* by its flocculation in 1 per cent lactic acid, which had no effect on *B. abortus*. Cerutti, however, found the flocculation test to be of no value. Professor

Eyre does not agree with the American workers' statement that the bacillary form represents the real shape of the *M. melitensis*, the subcultures in his laboratory are almost spherical in shape, and their minute size is still retained. Examination by dark-ground illumination has convinced him that the *M. melitensis* is a coccus and the *B. abortus* a bacillus. In hanging-drop preparations of the *M. melitensis*, he says: "The excursions of individual cocci can best be described as zig-zag to-and-fro movements within a limited space. With the *B. abortus*, however, we have a totally different picture; there is a refractile granule towards the pole of each individual bacillus resembling that seen in the pneumobacillus of Friedländer under similar circumstances, and the Brownian movement is that which is typical of a non-motile bacillus; it comprises a head-over-heels somersault movement and is limited to one spot."

As regards cultural reactions, he states, "I should not consider the appearance of the cultivations of the *B. abortus* upon solid media as suggesting more than a passing thought as to their identity with similar cultivations of the *M. melitensis*. In its earlier stages the *M. melitensis* is white, and only with advancing age does the peculiar amber colour which is so typical of these cultures make its appearance. *B. abortus* gives a yellowish film from the first, and the colour deepens rapidly to a light brown with no glistening amber stage."

We have examined subcultures of several strains of the *B. abortus*, including Bang's and *B. abortus* No. 80, and of the *M. melitensis* planted out on solid media at the same time, and have been unable to detect any definite morphological differences between them in stained preparations or by dark-ground illumination. The growths on solid media appeared to be identical; slight differences in colour might be seen in one strain or another, but these were not sufficiently marked to enable us to distinguish between the two organisms.

Agglutination by, and removal of agglutinins from, homologous sera have been used as distinguishing tests between the two organisms. Evans states that in an anti-melitensis serum the homologous strain is always agglutinated by a higher dilution than the heterologous *B. abortus*. From a melitensis serum the *M. melitensis* will absorb all the agglutinins which are active towards *B. abortus* suspensions, but the *B. abortus* will not absorb from this serum all the agglutinins which act on the *M. melitensis*.

Skaric absorbed a melitensis serum with *B. abortus*, and found that all the agglutinins for the *B. abortus* were removed, but those for the *M. melitensis* remained and were only removed when the serum was fully absorbed with the *M. melitensis*.

Khaled, however, reports that when he absorbed a melitensis serum with the *B. abortus* all the agglutinins for both the *B. abortus* and the *M. melitensis* were removed. But when an abortus serum was fully absorbed with the *M. melitensis* the agglutinins for the *B. abortus* remained in full titre though those for the *M. melitensis* were removed. Feusier and



Meyer have made extensive tests with eleven strains of *M. melitensis*, two strains of *B. para-melitensis* and *B. abortus* No. 80. They found that when *B. abortus* No. 80 serum was absorbed with ten of the strains of *M. melitensis*, the agglutinins for *B. abortus* were not removed; one strain, however, of *M. melitensis* No. 20 did remove the agglutinins for *B. abortus* and all the agglutinins for the other strains of *M. melitensis*. When the *B. abortus* No. 80 serum was absorbed with *B. abortus* No. 80 all the agglutinins for *B. abortus* were removed and also all the agglutinins for the various strains of *M. melitensis*.

A serum prepared with *M. melitensis* No. 20 was found to behave similarly to a *B. abortus* No. 80 serum; viz., all the agglutinins for both *B. abortus* and *M. melitensis* were removed by each of the organisms. These tests seemed to prove that *B. abortus* No. 80 and *M. melitensis* No. 20 are identical serologically. The remaining strains of *M. melitensis* could be arranged in two groups, which showed slight differences serologically between themselves, and all failed to remove the *B. abortus* agglutinins from a *B. abortus* serum.

Orcutt concludes that there is no serological difference between the melitensis strains and the abortus strains from cattle and swine, when tested by agglutination and absorption of agglutinins in unheated sera and by agglutination in heated sera, and by agglutination of heated cultures in unheated and heated sera.

Some Italian observers have stated that there is an important difference in the thermostability of the agglutinins; agglutinins for the *M. melitensis* being inactivated at 65° C., but those of *B. abortus* surviving up to a temperature of 75° C. Guigi and Rossi consider this test quite unreliable.

E. Valenti states that, in the case of the strains at his disposal, both *M. melitensis* and *B. abortus* were agglutinated by melitensis and abortus sera, but that when the lipoids of the antigens had been extracted after heating to 100° C. only *B. abortus* was agglutinated by abortus serum, while both organisms were agglutinated by melitensis serum. Using this method as a criterion for the identification of the organisms, he found that all his American strains isolated from human patients reacted as melitensis, though some of these had been diagnosed as abortus.

The bacteriological evidence which we have been able to obtain having shown that the *B. abortus* and *M. melitensis* are, if not identical, very closely related, let us now see if the reports of undulant fever associated with the presence of *B. abortus* lend any support to this assumption.

Contagious abortion in cattle has been known for many years in various parts of the world. Bevan states that the first outbreak of the disease in Southern Rhodesia occurred at Salisbury in 1906; the disease extended to Northern Rhodesia and to the whole of the Union of South Africa. In 1914 he showed that the serum of cattle suffering from the disease in Southern Rhodesia would agglutinate strains of *B. abortus* obtained from Great Britain, South Africa and British East Africa. In 1921 the blood of

a patient in Salisbury when diluted 1-200 was found to agglutinate the *B. abortus*; this was the first case of undulant fever diagnosed in Rhodesia.

If the fever in human beings were caused by infected milk, one would expect that the women and children on farms would suffer most; but Bevan states that it is the men who are most often affected, and it is thought that the *B. abortus* may be disseminated by dust in the kraals. It is a remarkable fact that specific abortion in cattle has been prevalent in the Marandellas district since 1914, but cases of Malta fever have only appeared in the last year or two.

According to Orpen, cases of undulant fever have appeared lately on farms in Rhodesia near infected herds, and the people affected have never drunk goat's milk. In the laboratory it was noticed that the blood-serum of fever cases agglutinated the *B. abortus* and the *M. melitensis* equally. The specific micro-organisms isolated from the cases were injected into rabbits, and the sera so prepared were subjected to absorption tests with European cultures of *M. melitensis* and of *B. abortus*, and with Rhodesian cultures of *B. abortus* from man and from cattle. As a result of these tests two groups of organisms appeared: (1) Containing European *M. melitensis* and *B. para-melitensis*; and (2) containing European and Rhodesian *B. abortus* and the microbes isolated from undulant fever in Rhodesia. Orpen suggests that there may be a group of overlapping races of the abortus-melitensis group of varying virulence, with the *B. abortus* of low virulence at one end and the *M. melitensis* of high virulence at the other.

Clarkin, writing in the *Kenya Medical Journal*, states that the *B. abortus* was recognized in Kenya many years ago, but undulant fever appeared only about three years ago. He thinks the virus may be modified by passage through the cow, and then produces undulant fever only in very susceptible people or in very large doses.

Skaric says that in Austria epidemics of contagious abortion are common, but undulant fever in man is unknown. He thinks it may be necessary for the virus to pass through goats before it can become pathogenic to man.

In Palestine there was an outbreak of specific abortion amongst cattle in 1921, and *B. abortus* was isolated from some of the cows. It was found that thirty-one per cent of the cattle examined gave a positive agglutination of the *B. abortus*, when the serum was diluted 1-40. In 1924 seven typical cases of undulant fever occurred, but the distribution of these cases was not coincident with the cattle disease, and goat's milk was believed to be the probable cause of the undulant fever.

In 1925 Favielli reported 120 cases of undulant fever in and about Florence; fifteen were in the town and the remainder in the neighbouring districts. Many of the cases had nothing to do with goats, nor did they drink goat's milk. Some cases, however, were believed to have acquired the disease by eating raw vegetables grown on soil contaminated by goats; others had been in contact with aborting cows.

## 112 *Mediterranean Fever and Contagious Abortion in Cattle*

Evans and Keeper, in America, have reported cases of fever associated with the presence of *B. abortus*, and the course of the disease was similar to, if not identical with, Malta fever.

Carpenter and Merriam give a very full description of two cases of undulant fever due to *B. abortus* which occurred in Ithaca, New York, in the spring and fall of 1925. Both cases occurred in university students. The first case was ill for twelve weeks and suffered from remittent fever, temperature fluctuating between normal in the morning and 103° F. to 105° F. in the evening; he had also rigors and profuse sweating. The spleen was enlarged, the lungs congested and he became markedly emaciated. The temperature gradually subsided in the last four weeks and the man made a complete recovery. The *B. abortus* was isolated seven times from the blood and twice from the urine. Agglutination tests were made with the patient's serum, the patient's culture, a known *B. abortus*, a known abortus serum, and the *M. melitensis*. The following results were obtained :—

Antigen serum		1-30	1-60	1-120	1-240	1-480	1-960
Patient's culture, patient's serum ..	..	+	+	+	+	+	+
<i>B. abortus</i> serum ..	..	+	+	+	+	+	+
<i>B. abortus</i> , patient's serum ..	..	+	+	+	+	+	slight
<i>M. melitensis</i> , patient's serum ..	..	+	+	+	+	+	—
Patient's culture, normal serum ..	..	—	—	—	—	—	—

The second case was comparatively mild; the temperature was never higher than 101.5° F. The other symptoms were essentially the same as those in the first case, except that they were much less serious. The *B. abortus* was recovered twice from the blood, but not from the urine.

Biologically, the two strains isolated were said by the absorption test to behave like the *B. abortus*, but details of the tests are not given. Abortion was produced in two heifers in their first pregnancies by injecting some of the culture intravenously. The cultures were virulent for guinea-pigs, and produced lesions similar to those following the injection of *B. abortus*. The source of infection in both cases might have been milk. Both cases drank large quantities of milk. The milk consumed by the first case was found to be heavily infected with the *B. abortus*, which was virulent for guinea-pigs. The second case had spent his summer vacation at a dairy where infectious abortion existed, but he did not come in direct contact with any of the cattle.

Neither patient had been in contact with goats nor had drunk goat's milk.

Huddleston reports that two students, working in the laboratory with the *B. abortus* and drinking milk which proved to be infected, also suffered from undulant fever. One student had prolonged fever, and his blood-serum diluted 1-2,000 agglutinated both the *B. abortus* and the *M. melitensis*; an organism identical with the *B. abortus* was isolated from the blood. The other student had fever of an ambulant type, and the *B. abortus* was isolated from the blood and the urine.

Bamforth describes two cases of undulant fever occurring in England. The first case was a woman who had never been abroad and was domiciled in London. In July, 1925, she went to live in a small village in Essex, and in November she was unable to work, felt tired, lost her appetite, and her feet became swollen. She returned to London in June, 1926, and suffered from severe headache, sore throat, frequent attacks of shivering and perspiration. The attacks of perspiration persisted and were accompanied by a rise in temperature in the evening. She was admitted into St. Thomas's Hospital on March 31; she had some abdominal tenderness, but no enlargement of the spleen. Blood-culture and agglutination tests were made the same day. The blood-culture proved to be sterile, but the "serum showed positive agglutination against *M. melitensis* to a titre of 1-2,000 and against *B. abortus* to 1-2,000." Against *B. typhosus* and *B. paratyphosus* A, B and C, the reactions were completely negative. Cultures made from the urine were negative. The temperature did not show a very marked undulant character and became normal on April 16.

The second case was a market gardener who lived in a small village in Kent. He had lived in France during the War, but otherwise had never been abroad. Undulant fever appeared to commence insidiously in the summer of 1926; he had three attacks of fever with short intervals of apyrexia. He was admitted to St. Thomas's Hospital during the third attack. Cultures were made with the urine and blood, but with negative results. The blood-serum diluted 1/1,000 agglutinated *M. melitensis*, but a dilution of 1-2,000 agglutinated the *B. abortus*.

Both patients drank milk obtained from farms in their immediate vicinity, and in both cases there was a vague history of abortion among the cattle on the farms. Goat's milk was not taken by either case, nor were there any goats in the immediate neighbourhood.

In view of the above evidence, we think it must be admitted that the *B. abortus* is pathogenic to man, and that in certain circumstances cow's milk infected with the bacillus may produce a fever of undulant type in human beings.

All observers are agreed that the *M. melitensis* is much more virulent for man than the *B. abortus*, and a certain relatively large, but as yet undetermined, dosage of the latter organism is required to produce fever in man. Schroeder and Cotton, by injecting cow's milk into guinea-pigs, found that fourteen per cent of the samples tested were infected with the *B. abortus*. Fleischner and Meyer inoculated certified milk into guinea-pigs and stated that the *B. abortus* is always present in the certified milk of the San Francisco Bay regions.

Evans determined the number of abortus and abortus-like bacilli in the milk of cows of known origin, and found that although there may be numerous abortus-like bacilli in the milk of cows which have aborted, the actual number of virulent bacteria which persist in the milk is not great, and in all probability it is negligible in many cases in which the milk and serum

contain agglutinins. In this way she explains the remarkable fact that a disease resembling Malta fever is not prevalent in America, though strains of abortus bacilli are frequently reported to be present in the public milk supply.

Wilson and Nutt calculated that 5·7 per cent of single milks and 8·8 per cent of mixed milks were infected with *B. abortus*. The milks that were found to contain the *B. abortus* came from different herds distributed over Cheshire, Lancashire, Derbyshire, Staffordshire and Cumberland. From this they conclude that *B. abortus* infection in cows in this part of the country is widely disseminated.

They injected 1 c.c. of the centrifugalized deposit of each of the milk samples into guinea-pigs. Frequently one gland only, the superficial or deep inguinal or sublumbar, was enlarged and congested; no organisms of any kind were detected microscopically. Occasionally, with or without glandular affection, the spleen was somewhat enlarged. Cultures were made from the gland most noticeably diseased or from the spleen. Subcultures on agar or glycerine agar were successful only if the tubes were sealed with paraffined corks, showing that the organism preferred an oxygen tension lower than that of atmospheric air.

It appears, therefore, certain that cases of undulant fever may be produced by drinking infected cow's milk, and, with the tests at present available, the diagnosis depends on whether the specific bacillus, if isolated, is agglutinated in a higher dilution by anti-abortus or by anti-melitensis serum; or, failing the recovery of the specific microbe, whether the highest dilution of the patient's serum agglutinates the *B. abortus* or the *M. melitensis*. If the specific bacillus is not isolated it may be difficult to make a diagnosis, as cases have been reported in which the blood-serum agglutinates the *B. abortus* and the *M. melitensis* equally.

The most characteristic feature of *B. abortus* infection in the cow is the certainty with which abortion results. According to Dubois, when a herd of goats becomes infected with the *M. melitensis*, abortion is frequent in the early days of the outbreak, but usually goats soon become immune and abortion rarely follows pregnancy. Evans, in 1923, produced abortion in a cow by injecting it intravenously with the *M. melitensis*. This is, however, a rare occurrence, and abortion is certainly not so common in goats infected with the *M. melitensis* as it is in cows infected with the *B. abortus*. The use of a melitensis vaccine has been suggested as a preventive of infectious abortion in cows, and it is curious to note that in olden days it was thought that when a billy-goat was put into a herd of cows the chance of infectious abortion arising was much diminished.

From the above brief review it is clear in the first place that there is some fairly close relationship between the two organisms, and, secondly, that the nature and degree of the relationship has not yet been demonstrated. The divergence in the results of the experiments by different workers suggests that there are variables which have not been taken into account or

eliminated. In view of the recent observations on the several antigenic components apparently to be found in varying quantities in different cultures from the same original stock and associated with the properties of heat stability or lability, types of flocculation and characters of colonies, it seems possible that a study of variants of either or both of these organisms might enable the previous work to be co-ordinated and discrepancies to be explained.

Hadley is of opinion that the work of Burnet strongly suggests that the latter's type II *melitensis* and the para-*melitensis* of many other workers represent the R form of culture, or at least a culture in the course of transformation to the R state.

As the matter stands at present, the serological findings might tempt one to hazard the hypothesis that *B. abortus* and *M. melitensis* may be derived from one common stock, and to consider that the power of producing abortion in cattle and the comparatively feeble pathogenic action on human beings of the *B. abortus* are due to its passage through cattle, while the marked pathogenic action on man and feeble power of inducing abortion in cattle of the *M. melitensis* are due to its passage through the goat.

On the other hand, the very widespread distribution of contagious abortion and the comparatively small incidence of undulant fever are very strongly against such a close relationship between the organisms. Laboratory experience has, unfortunately, shown that *M. melitensis* does not lose its virulence at all easily, in fact it is remarkable how long it retains it when maintained on artificial media.

Incidentally, it is of interest to note that it has long been known that the unheated serum of some apparently normal persons is capable of agglutinating *M. melitensis*, and this suggests that they have been exposed to some antigen capable of producing agglutinins allied to that of *M. melitensis*.

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## Clinical and other Notes.

### THE DETERMINATION OF AVAILABLE CHLORINE IN WATER-STERILIZING POWDER (CHLORINE) BY MEANS OF THE HORROCKS BOX AND HYPO TABLETS.

By MAJOR S. ELLIOTT, O.B.E., T.D.

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THE method detailed below is the result of work undertaken at the request of many interested in the subject of the chlorination of water supplies, and although it does not give the accuracy obtainable in a chemical laboratory, the results obtained should be sufficiently good for rough work in the field.

*Apparatus required.*—Case, water testing, sterilization. Tablets containing 0.1 gramme (1.5 grains) of hypo. Acid soda-bisulphate tablets, or case, water testing, poisons.

*Method :*

(a) *To make the Standard Hypo Solution.*—Dissolve one tablet of hypo in the cleanest water available in one of the white cups in the case, dilute until the cup is brimful, and mix thoroughly by stirring gently. (Strength, 0.05 per cent.)

(b) *To make the Standard Water-Sterilizing Powder Solution.*—Measure out a level scoopful of water-sterilizing powder into the black cup of the test-box. Mix into a thin paste with water and dilute to the white line in the usual way. After standing a few minutes, during which time the two scoops in the box can be cleaned and rubbed over with a greasy rag, stir the solution of water-sterilizing powder thoroughly and transfer a level scoopful of it to a clean white cup about a quarter-full of clean water.

(c) *The Titration.*—Pour into the white cup containing the diluted water-sterilizing powder solution about a teaspoonful of the iodide and starch indicator and then about the same amount of hydrochloric acid from the “case, water testing, poisons,” or use a bisulphate of soda tablet. The contents of the cup turn blue-black. Add to this, level scoopfuls of standard hypo solution, stirring between each addition, and counting carefully the number added. When the colour just disappears, the number of scoopfuls of hypo added represents the percentage of available chlorine in the powder.

*Example.*—The experiment required 26 scoopfuls of hypo to discharge the blue-black colour, the powder has therefore about 26 per cent available chlorine.

During the course of these experiments, it was found necessary to

check very carefully the errors likely to occur owing to variations in the capacity of the apparatus supplied with the Horrocks box, and careful measurements were made on the contents of a few boxes on charge at this College.

*The Black Cup.*—It was found that filling to the white line gave volumes varying from 240 to 250 millilitres, depending on the error inherent in the graduation and on the observer's idea of the true level of the water (i.e., the top or the bottom of the meniscus). In the method detailed this causes very little error.

*The White Cup.*—Held anything from 205 to 215 millilitres when filled to overflowing.

*The Metal Scoops.*—These held from 3.1 to 3.3 millilitres of water, with an average of 3.2. Also they held various weights of powder, as follows:—

*Ordinary Calc. Chlorinata.*—Measurements varied from 1.45 grammes to 1.88 grammes with a mean of many experiments of 1.70 grammes. It was found that the higher weights were obtained when the powder was pressed tightly into the scoop and vice versa.

*Water-Sterilizing Powder (Chlorine).*—In this case the powder is drier and free from lumps, so closer results were obtained, weights varied from 1.64 to 1.86 grammes with an average of 1.78 grammes. A trial sample of water-sterilizing powder (chlorine 33 to 35 per cent) gave a fairly constant figure of 2.36 grammes in a scoopful.

*Dropping Tubes.*—These gave drop measurements with water of from 0.055 to 0.063 millilitre per drop when the tube was held vertically, with an average of 0.06 millilitre, but bleach solution from the black cup, for some reason or other, gave very constant results at 0.08 millilitre per drop with tubes of 5 mm. external diameter. These measurements were made at about 60° F., possibly they may vary at other temperatures.

It may be interesting and helpful to others who may try to obtain more exact results by other methods, to outline a few of the trials made before this method was devised:—

(1) The water-sterilizing powder (chlorine) was mixed in the proportion of one scoopful to nine of water, one scoopful taken out and titrated with scoopfuls of hypo solution, but the results varied up to six per cent from the correct amount.

(2) Instead of measuring the hypo by scoops, drops of a stronger hypo solution were tried but the results were not satisfactory, owing to the errors in the preparation in the strong solution of the water-sterilizing powder (chlorine). It was also found to be somewhat tiresome, measuring out thirty or so drops and stirring between the addition of each.

(3) Then a scoopful of water-sterilizing powder was mixed with water, acid and indicator direct, and it was proposed to titrate with drops of strong hypo, but there was much loss of chlorine gas unless a large amount of indicator was used.

From the results of many such experiments one gained the impression



that if a strong solution of water-sterilizing powder was titrated against a strong solution of hypo, loss of chlorine occurred with correspondingly low results unless large quantities of iodide indicator were used. On the other hand, if too high a dilution was made, errors would creep in through the comparative inaccuracy of the measures in the Horrocks box, and the hypo tablets would be too small.

The following results were obtained with various types of water-sterilizing powder by various observers, and from them some idea of the accuracy of the method may be gauged.

Type of bleach	Author's results	Major Jameson	Sjts. Langley and Welch	Pte. Young	Remarks
Calc. chlorinata 18 per cent	Per cent	Per cent	Per cent	Per cent	Powder sample from bulk was not of even strength throughout
	19·0	14·0	15·0	21·5	
	19·0	18·0	16·5	21·0	
	17·0				
	17·0				
Water sterilizing powder (chlorine 11 per cent)	19·0				—
	19·0				
	9·0	11·5	10·5	10·0	
	10·0			10·0	
	10·0				
	9·0				
	9·0				
	9·0				
	10·5				
United Alkali Company's new sterilizing powder, 81·9 per cent	10·0				Approximately half scoopfuls were used to obtain 0·5 per cent result
	10·5				
	10·5				
United Alkali Company's new sterilizing powder, 81·9 per cent	36·0	35·0	35·0	36·0	High result owing to scoop holding 2·36 instead of 1·7 grammes
	36·0		36·0	36·0	

In conclusion, I have to thank Colonel P. H. Henderson, Professor of Hygiene, for suggesting this investigation, and also Major G. D. Jameson for valuable suggestions in connexion with it.

## A SUGGESTION AND TWO CLINICAL CASES.

BY MAJOR C. M. FINNY, F.R.C.S.

*Royal Army Medical Corps.*

I THINK it was Sir James Paget who, when asked what were the most important branches in the art of healing, replied, "There are three. The first is diagnosis; the second is diagnosis; and the third is diagnosis."

I may be guilty of a misquotation, but the meaning is clear.

Possibly some, particularly surgeons, will not subscribe to this dictum, but none will deny that scientific treatment is impossible without a preliminary diagnosis, although in the case of surgery the complete diagnosis cannot always be made until after the operation has been begun.

Apart from its practical value, there is a distinct charm in the attempt to arrive at the correct diagnosis of a difficult case; and the art depends on the application of knowledge to the particular case, the degree of success exhibited depending on experience or a "flair."

We, in the R.A.M.C., are scattered over the British Empire, and are frequently posted in small stations where the amount of clinical experience available is small, and our patients are mainly drawn from a collection of peculiarly healthy individuals. But against this our wanderings put us in the way of seeing interesting diseases, not met with in England, and sometimes in patients of different races.

There is probably no military hospital, however small, in which among the usual collection of "bronchitis catarrhal," "sprain knee" and "I.A.T. hand," there does not occasionally occur a case which exercises the brains of the entire staff, and of which the diagnosis is perhaps only cleared up in the post-mortem room.

I wish to suggest that such diagnostic problems should not remain confined to the hospital in which they occur, but that the pages of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS should be utilized to enable those of us who take an interest in the clinical side of our profession to share the interest—if not the anxiety—of those faced with the diagnosis of unusual cases.

Most of us will remember the "cases for commentary" which were a feature of the Corps entrance examination, and I suggest that cases should be presented in a similar form. A case sheet is in most instances kept for such patients, and an abridged copy of this document is little more than is required. If the idea proved popular and the editor found it feasible, possibly the dénouement—whether in the operating theatre or the post-mortem room—might be published in the Journal of the following month.

As an example, the following case caused us considerable difficulty in diagnosis.

When all its diagnostic points are marshalled it may appear easy to some, but there were several features which tended to confuse the issue.

Private McA. was on his way home from Egypt, when he reported sick and was put ashore at Malta on September 20, 1926, with a diagnosis of pneumonia.

He stated that he had enjoyed good health while abroad, and had escaped all intestinal disorders until last October, when he was operated upon for appendicitis.

He was in hospital for seven weeks, and since then never felt in good health, but did not feel really ill until September 16. Since then he suffered from a general feeling of malaise and some pain over the base of the right lung, and occasionally in the region of the right clavicle. Temperature 102° F., pulse 96, respiration 22. He looked ill, and had a persistent cough with mucopurulent sputum. Crepitations could be heard in both lungs, particularly the right, the base of which was relatively dull.

September 25: No change in general condition, temperature continued between 102° and 103° F. A well-marked pleural rub is audible at the base of the right lung.

September 26: Patient passed two large stools containing much altered blood.

His stools were twice examined for dysenteric organisms, with negative result.

His sputum was negative to tubercle, but contained pneumococci.

September 29: Further intestinal hæmorrhage during the night. Patient looked anæmic and said he felt "all anyhow," but had no pain or tenderness, except some dull pain in the region of the right clavicle. The lower margin of the liver extended two and a half inches below the costal margin. No tenderness could be elicited over the liver, but its movement on respiration was restricted. The upper limit of hepatic dullness was normal in front and could not be determined behind, as from the angle of the scapula downwards the right lung gave a dull note on percussion. The pleural friction was no longer audible in the dull area, expiration was prolonged and there was marked whispered pectoriloquy. Examination with the fluoroscopic screen showed the left dome of the diaphragm moving freely. On the right side this could not be seen owing to a shadow with diffuse upper limit which covered the lower half of the right lung. The right side of his chest was found to be one inch greater than the left in circumference, and a blood-count revealed a pronounced leucocytosis with eighty-nine per cent. polymorphs.

September 30: Operation. An exploring needle inserted through the eighth interspace in the posterior axillary line struck pus at a depth of one and a half inches. Two inches of the ninth rib was resected and the pleura opened, with an escape of serous fluid.

The upper margin of the parietal pleura was stitched to the adjacent diaphragmatic pleura and an opening made through the diaphragm. Pus was encountered at once, mixed with blood and disorganized liver tissue.

The abscess cavity was bounded superiorly by the diaphragm and appeared to occupy about half the right lobe of the liver. A large drainage tube was inserted and the remainder of the wound closed.

No amœbæ were found in the pus, which proved sterile on culture.

The patient stood the operation well, and the same evening expressed himself as feeling better than he had done for weeks. The subsequent course was, however, very disappointing. He did well for several days; there was no infection of the pleura and he had no further pain, but on October 3 he suddenly became collapsed and pulseless, and shortly after passed two large stools full of dark blood. He rallied slightly and retained consciousness for several hours, when his circulation suddenly failed, and he died in a few minutes.

*Post-mortem.*—The liver was enlarged and the greater part of the right lobe was occupied by a large abscess, containing much necrotic liver tissue and pus.

It had ulcerated through the liver capsule on the right side, and had been only prevented from invading the general peritoneal cavity by adhesions with the parietal peritoneum. Superiorly it had eroded the diaphragm and was adherent to the base of the lung, above which point there was an area of consolidation. Both lungs were congested at their bases, and the pleural cavities contained a few ounces of serous fluid.

The stomach and small intestine were normal in appearance and contents, but the large intestine contained blood, and numerous oval ulcers were found in the ascending colon and cæcum, the wall of which was thickened.

The chief sources of difficulty in the diagnosis of this case were the patient's repeated denial of all history of dysentery or diarrhœa, the expectoration and physical signs of disease of the lung, the absence of pain and tenderness of the liver and short duration of illness. It was the persistent high temperature and general malaise—more than could be accounted for by the physical signs in his lung—enlargement and fixity of the liver, and finally leucocytosis which brought him to the operating table.

Death was due to hæmorrhage from dysenteric ulcers. This is an uncommon cause of fatality, and must be very rare in cases which have exhibited no previous symptoms of dysentery.

The following case provides an instructive contrast to the above :—

Serj.-Major L., R.A.F., came out to Malta in April, 1926, to serve his first tour of foreign service.

He was admitted to hospital on July 2, with symptoms of dysentery, but four examinations failed to reveal amœbæ or other dysenteric organisms.

He was discharged from hospital on July 27, but was readmitted on September 13, looking ill and wasted. He complained of severe persistent epigastric pain, and stated that for the past month he had completely lost his appetite and had been steadily losing weight.

He had not vomited, and his bowels had acted regularly with the aid of a daily aperient.

The pain was confined to the upper part of the epigastrium and was not appreciably influenced by ingestion of food or action of the bowels.

On examination, he looked wasted and anæmic—a rapid change for the worse since he left hospital—and there was well-marked tenderness when pressure was applied to xiphisternum and upper ends of the recti abdominis, which were more contracted than normal.

The liver was not enlarged, and, apart from a furred tongue and an evening rise of temperature, no other physical signs of disease could be made out.

September 20 : No improvement. His temperature since admission had been of the intermittent type. A barium meal revealed no abnormality in the stomach, and the liver was also found to throw a normal shadow, and the diaphragm was seen to move freely on both sides; but while standing for the screen examination a slight but definite fullness was observed in the epigastrium.

A blood-count showed 15,000 white cells per cubic millimetre with eighty-three per cent. polymorphs.

Operation was advised.

September 21 : Operation. The abdomen was opened by a right paramedian incision.

The stomach was found to be normal, but the anterior surface of the liver was adherent to the parietal peritoneum below the sternal notch. The peritoneum was therefore closed, and an incision made directly into the liver where it was adherent.

Blood-stained pus was struck almost immediately, and about eight ounces were evacuated. The abscess cavity, which extended about five inches from the surface, was swabbed out with eusol and a large drainage tube inserted.

There was very little subsequent drainage from the tube, which was removed on the eighth day.

The operation immediately relieved all his symptoms, the wound healed by first intention, except at the site of drainage, and he was getting up and eating ravenously by October 8. No amœbæ were found in the pus or scrapings from the wall of the abscess, and the pus was sterile.

He was given a course of ten grains of emetine during his convalescence.

Despite the failure to find the specific organisms and the rarity of amœbic dysentery in Malta, there can be little doubt that the above was an amœbic liver abscess.

It must be unusual for so small an abscess to cause such severe pain and rapid deterioration of health.

An interesting point was the way in which the abdominal incision

healed, as cleanly as an aseptic abdominal section, despite the fact that it was bathed in pus when the abscess was opened.

Probably this was a case which would have responded to aspiration and a course of emetine, had it been diagnosed before operation.

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## NOTES ON AN UNUSUAL COMPLICATION OF GONORRHOEA.

By MAJOR A. L. ROBERTSON, O.B.E.

*Royal Army Medical Corps.*

THE patient, Driver A—, age 21, service two years, was transferred to hospital on October 19, 1926, with a diagnosis of "chronic balanitis," having been treated elsewhere for three days previously. On admission he was found to have an œdematous paraphimosis, the pillow of œdema was limited on the proximal side by a deeply ulcerated constriction. The meatal and frænum areas were superficially eroded. There was a profuse, purulent, urethral discharge, teeming with gonococci.

When the acute condition had been reduced routine treatment was instituted. By October 25, 1926, no gonococci were found in urethral smears, and the line of ulceration was healing.

On the morning of October 26, urine analysis was normal. On the 28th he complained of malaise and shivering, and his temperature was found to be 105° F., his pulse 100 and his respirations 30 per minute. At 6 p.m. on the same day his temperature rose to 106° F., pulse and respirations correspondingly accelerated. Blood-smear showed no parasites.

On October 29 a general physical examination was made, but no abnormal signs were found. Five cubic centimetres of his blood, taken into broth and incubated, showed no growth even after ten days' culture. A blood-smear and thick drop again showed no malaria parasites.

His temperature was brought down to 102° F. by diaphoretics, etc. In the evening he complained of vague joint pains. He occasionally coughed up viscid, blood-stained sputum, which, on examination, showed only the usual organisms. No tubercle bacilli were found. Perspiration was profuse, and accompanied by a distinctly musty odour.

On October 30 his temperature rose to 105° F. again. A blood-smear taken at the time was negative. Aching was complained of about the shoulder-joints.

October 31: Temperature 101° F. to 102° F., pulse and respirations in accordance. Tongue dry, unfurred and of a raw red colour. Patient is inclined to be somnolent. Urethral discharge has ceased and the prepuce is normal.

November 1: Aching pains in right shoulder only, and there is stiffness in the movements of that joint. The abdomen, upper arms and thighs

show a patchy urticaria. He coughs up viscid, stained sputum occasionally.

November 3: Œdema has appeared in right leg and foot. Right arm is still stiff to movement.

November 5: Both legs and feet and right arm are œdematous, the swelling being extra-articular. Aching in ankle-joints. Both saphenous veins stand out and can be felt like cords, extending from groins to above knees.

November 6: Cough and expectoration practically ceased. Temperature  $101^{\circ}$  to  $99^{\circ}$  F. and gradually falling. Tongue clean, red and dry.

November 9: Temperature  $101^{\circ}$  F. to  $98^{\circ}$  F., pulse and respirations keeping pace. Œdema disappearing from right arm and right leg. Patient is unable to raise his right arm. Saphenous veins still palpable.

November 10: Blood taken and put up for agglutination tests against T.A.B. Results:—

<i>Bacillus typhosus</i>	..	..	1 : 500	..	..	Units 67.5
<i>Paratyphosus A</i>	..	..	1 : 250	..	..	62.5
<i>Paratyphosus B</i>	..	..	1 : 100	..	..	31.5

November 12: All œdema gone from right arm, the movement of which is being regained.

November 17: Œdema gone from legs, but veins still cord-like. Blood-serum again set up against T.A.B. and agglutinates:—

<i>B. typhosus</i>	..	..	..	..	1 : 500
<i>Paratyphosus A</i>	..	..	..	..	1 : 250
<i>Paratyphosus B</i>	..	..	..	..	1 : 100

November 18: Œdema has returned to both lower limbs.

November 21: Abrupt rise of temperature to  $103.6^{\circ}$  F.

November 22: Temperature down to  $99^{\circ}$  F. Pain on pressure is felt over right shoulder-joint.

November 24: Blood taken for Wassermann reaction gives a negative result. Urine analysis normal.

November 26: Temperature beginning to rise. Patient complaining of right shoulder pain.

November 29: Temperature  $103^{\circ}$  F.

December 1: Differential blood-count made shows: Total leucocytes, 9,800; polymorphs, 44 per cent; lymphocytes, 49 per cent; large monos, 5 per cent; eosinophils, 1 per cent; transitionals, 1 per cent.

December 2: Stiffness at the junction of middle and lower third of the right thigh on the outer aspect is complained of. A small area of definite firmness can be felt there.

December 5: Area of four inches diameter swollen and tense on thigh. Temperature  $101^{\circ}$  F.

December 10: Area on thigh incised and an abscess found beneath the extensor muscles. A pint of pus was evacuated, which, on examination and subsequent culture, was found to contain gonococci only.

December 14: Patient's temperature, pulse and respirations have remained normal. Drainage tubes have been removed and he is quite comfortable and cheerful.

December 16: Temperature rose to 100° F. Blood taken for culture.

December 18: Cavity has closed up and is healing quickly. Gentle voluntary movements of the thigh gave no pain. Temperature swinging between normal in the mornings to 100° F. in evenings. No discomfort. Eats and sleeps well.

December 20: Prostatic examination done. Nothing abnormal palpable. No tenderness. Temperature below normal for last two days.

December 21: Blood-culture (taken on 16th inst.) reported negative. Temperature below normal.

December 22: Improving.

December 23: Allowed to sit up in wheeled chair for one hour.

December 25 and 26: Patient up for afternoon. Improvement thereafter steadily maintained.

January 13, 1927: Patient is up and about all day.

I wish to express my thanks to Lieutenant-Colonel Winder, D.S.O. R.A.M.C., Officer Commanding York Military Hospital, for permission to publish the notes on this case.

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## REPORT ON A CASE OF MOVABLE KIDNEY.

BY LIEUTENANT K. FLETCHER-BARRETT.

*Royal Army Medical Corps.*

THE following case is published partly on account of its comparative rarity in men, but mainly because of its interest from a diagnostic point of view.

Private B., a well-nourished man, aged 33, with fifteen years' service, was admitted to hospital on October 11, 1926, complaining of griping pains in the epigastric region, recurring at intervals of ten minutes and of twelve days' duration. Three months previously he had pain of a similar character. He had suffered from what was described as indigestion in May, 1926, and malaria in India, in 1914 and 1919.

His condition on admission was as follows: Temperature, pulse and respiration normal. There was a pyriform swelling in the right umbilical region—dull to percussion—stretching from the liver dullness to about two and a half inches from the symphysis pubis. This swelling moved up on expiration. There was no jaundice, no change in weight, and no urinary symptoms. He was treated with laxatives and rest in bed.



His subsequent progress was as follows: October 16, 1926.—The swelling had apparently moved over to the left side about two inches from its previous site. A specimen of urine was taken under aseptic conditions.

October 17.—Swelling back in its old position. No alteration in attacks of pain. Result of urine examination: slight acidity and no blood; deposit of phosphates and a few leucocytes; granular casts present.

October 18.—Exploratory laparotomy decided upon on the arrival of cooler weather.

October 27.—After suitable preparation was X-rayed. Report:—

“(1) Diaphragm on right side higher than normal.

“(2) There is a well-marked opaque shadow running down under right rectus area. A well-marked opaque shadow seen on edge of pelvis on right side—probably fæces. Nothing else seen.

“(3) No disease or deformity of spine shown. Well-marked shadow in left kidney area. No gall-stones are shown.”

November 2.—No alteration in character of pain. Swelling has decreased in size about one and a half inches, but position still the same.

*Exploratory Laparotomy.*—Right paramedian incision from umbilicus to just below costal margin. Muscle split and peritoneum opened. The right kidney was found to be freely movable, and could be delivered completely out of the wound. The kidney, which apart from its mobility was apparently normal, was replaced in its normal position. The abdomen was closed in layers, and a firm pad and bandage placed over wound.

November 23.—The patient was up for the first time.

December 13.—Discharged from hospital and recommended for two months' light duty.

I saw this man fifteen days after his discharge from hospital (just prior to the departure of his unit from the station). He had had no return of symptoms, nor could the kidney be felt to be unduly movable.

Some years ago the patient had been a heavy beer drinker. Originally, it was thought that the condition was caused by a dilated gall-bladder due to a stone in the cystic duct. The fact of the tumour moving over to the left side on October 16, 1926, was regarded as an error in observation.

I am indebted to Major W. J. Weston, D.S.O., Commanding the Military Hospital, Khartoum, for permission to publish this case.

# “DYSENTERY” IN NORTHERN IRAQ.

BY LIEUTENANT-COLONEL D. S. SKELTON, D.S.O.

*Royal Army Medical Corps.*

*Senior Medical Officer, Iraq Levies.*

MAJOR J. W. MALCOLM, O.B.E., M.C.

*Royal Army Medical Corps.*

AND

SERGEANT R. LLOYD,

*Royal Army Medical Corps.*

*(1st Class Laboratory Attendant.)*

IN the 1923 Report on the Health of the Army it is mentioned that as regards dysentery nearly all the cases in Iraq were amoebic. This statement produced a considerable discussion in the pages of the *British Medical Journal*. Major Bonney, R.A.M.C. (ret.) mentioned his experience and produced figures which showed that in a series of 250 cases fifty-one per cent. were proved bacillary and twenty-six per cent. only were amoebic [1].

Major Bonney further referred to a rise in the amoebic rate that had once occurred, which he ascribed to the idiosyncrasy of an officer working in his laboratory who was in the habit of getting mixed up between *Entamoeba histolytica*, non-pathogenic amoebæ and macrophages.

Dr. G. F. Mitchell was in agreement with Major Bonney's figures and stated that in his Iraq laboratory experience there occurred two cases of bacillary dysentery to every one of amoebic [2].

Dr. Jerwood, however, gave it as his opinion, founded on his work at 133 General Hospital at Kut, that in 1918 and for the two and a half years during which the hospital existed, *E. histolytica* was usually found in dysenteric stools.

Dr. Jerwood refers also to the varying conditions in different parts of Mesopotamia, which might possibly produce a change in type of dysentery [3].

The figures affecting the Middle East in the Report of 1923 are as follows:—

				Total	Amoebic	Bacillary
Iraq	..	..	..	207	181	?
Turkey	..	..	..	112	1	61
Egypt	..	..	..	64	35	29

Major J. A. Manifold, D.S.O., R.A.M.C., published an extremely informative article in the *Journal* in February, 1926, giving his experience of dysentery in India.

He gave two sets of figures, his own results being:—

Total cases	..	..	..	..	..	129
Amoebic	..	..	..	..	..	12
Bacillary	..	..	..	..	..	117

From the above summary it will be understood that though it is of vital importance to arrive at a correct diagnosis of any dysentery, yet it is by no means always easy to do so, and this inference is confirmed by our own work in Mosul. The war experience of two of us in Iraq and Persia convinced us that, so soon as we had laboratory facilities available in the Central Hospital of the Iraq Levies at Mosul, all cases of diarrhoea must immediately be investigated as a routine measure. This has been done, and the results obtained in a series of 187 cases of "Clinical Dysentery," that is to say in cases presenting symptoms of diarrhoea with blood and mucus in the stool, accompanied by more or less severe constitutional disturbances, are available.

It may be mentioned that possibly one of the commonest ailments met with among British officers and N.C.O.'s serving in Mosul is the so-called "Mosul-tummy," and the prevalence of this at times almost universal complaint made this laboratory investigation the more necessary.

Our figures are as follows:—

PERIOD, OCTOBER, 1925, TO DECEMBER, 1926.					
					Cases
Total cases investigated	..	..	..	..	187
Bacillary dysentery	..	..	..	..	29
Vegetative amoebæ found	..	..	..	..	1
<i>E. histolytica</i> cysts found	..	..	..	..	32
Ova of intestinal parasites found	..	..	..	..	16
<i>Bacillus typhosus</i> isolated	..	..	..	..	1
Tubercle bacillus seen	..	..	..	..	1
Negative results	..	..	..	..	107

As regards the bacillary cases, the figures are:—

						Cases
Gaertner group	..	..	..	..	..	14
Flexner	..	..	..	..	..	8
Morgan	..	..	..	..	..	1
Shiga	..	..	..	..	..	1
Unclassified	..	..	..	..	..	5
						29

The 107 cases in which nothing could be found is rather a disappointing figure, but it is in accordance with the experience of other laboratory workers. Our cases were collected from a variety of sources, some at a distance from the hospital; in addition to which, medical officers were not always alive to the necessity of sending specimens to the laboratory as early as possible. In view, however, of the fact that the greater number of these 107 negative cases were searched by at least two of us for vegetative parasites before being turned down, there remains a probability that they were bacillary in origin rather than amoebic, whilst the reaction to saline treatment supported this presumption.

In interpreting our results we see no reason for surprise that all laboratory results in Iraq are not in agreement. Iraq is a big country with widely varying conditions. There is no resemblance in the climatic conditions at Basra and those in Mosul for example, and conditions at Mosul are not

quite the same as prevail in Baghdad or Kut. The only factors common to the whole country are dirt and dust and flies.

The general conclusion we arrive at is that the commonest form of "dysentery" in the Mosul area of Iraq is associated with bacillary invasion and the commonest variety of bacillus appears to belong to the Gaertner group.

This predicates dirt in the kitchen or dirt on the hands of the cook and his assistants. Even with efficient fly proofing, until the mess sergeant or the mess corporal forcibly washes the hands of the cook with some strong antiseptic from time to time in the course of the day, so long shall we suffer from diarrhoea and mild dysentery.

#### REFERENCES.

- [1] *Brit. Med. Journ.*, February 13, 1926, p. 303.
- [2] *Ibid.*, March 6, 1926, p. 449.
- [3] *Ibid.*, March 20, 1926, p. 545.

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## Travel.

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### L'OISEAU ROUGE.

By U. P. A.

(*Continued from p. 62.*)

#### II.—THE PUNJAB AND THE U.P.

A LAND of great traditions which are still in safe keeping. Within its borders the lotus-eater is of no account; it breeds a hardy, martial type.

L'Oiseau Rouge climbs an easy gradient to an opening in the low foothills: Nicholson's Nek; and, as we top the rise, the vast plain of the Punjab stretches away and away before us.

The smoke of Rawalpindi can be seen in the distance.

The hill on the south side of the nek is crowned by a lofty monument to the memory of John Nicholson. The design of the monument is singularly appropriate: simple, honest, bold.

Here there is a "bonnie wee well on the briest o' the brae," grassy patches and spreading trees; obviously the place for the wayside tiffin.

#### MENU (BY THE HOP)

*Curry Pups.*

*Esthilton Cheese Sandbeefs.*

*Apples and Chocolate.*

*Bottley (i.e. thermos) Gurram Koffee.*

The Hop's own menu must have been different, for he retired behind the car and produced I-don't-know-what from a duster and a small tin box. The latter was divided into about ten different compartments. He

finished up by drinking copiously from the spring, washing in the overflow trough and making various sounds which I hoped Georgina did not hear.

Before we reached Rawalpindi Georgina did make some trenchant remarks about garlic and onion, but otherwise The Hop's gastronomic performance passed without notice.

So many of our officers have served in 'Pindi that, at the outset, I decided I had better remain anonymous. I knew that, when I came to 'Pindi, I'd say something which somebody or other would be certain to contradict flatly and, mayhap, with acerbity. There is little satisfaction in attacking a *nom de plume*.

'Pindi features :—

(a) A delightful climate. In winter so cold and raw that you are frozen to the marrow. In summer not too hot. Hot as hell, certainly ; but not as hot as, for example, Lahore.

(b) A racecourse with pretensions. Whenever a favourite wins bonfires are lighted and fireworks are blazed off. There is, however, no great outlay on pyrotechnics.

(c) A Mess of the R.A.M.C.

(i) The P.M.C. is elected for his epistolary powers. His duties are confined solely to carrying on a correspondence with the Central Mess authorities in London on the subject of "Absorption *v.* Independence." Some officers regard this correspondence as a joke. This is a mistake, and shows a sad lack of appreciation of ancient customs. If there were no such correspondence the P.M.C. would have to be given some other work to do. This would upset the conduct and traditions of the Mess to such an extent that the institution might as well go out of business forthwith.

(ii) Another ancient custom in this Mess is that of entertaining all officers and their wives after Church Parade on Christmas mornings. On the conclusion of these functions members of the garrison (*not* R.A.M.C.) have been known to scale the wall between the Mess and the Church. Whether they were under the impression that they were late for church, or that they were in need of fresh absolution, has never been clearly established. Georgina bids me add that the Mess records prove that the majority of such persons have been bachelors.

(d) The best hotel in India. Some may say "Rubbish !" and others will accuse me of giving the place a gratuitous advertisement. Nevertheless as it is the best hotel I think one ought to say so.

(e) An extraordinary Indian haberdashery shop, famed from Peshawar to Delhi. Let us call it Ganesh Lal's. It is a big place, but it ought to be bigger : four times bigger.

You want a khaki shirt. To get to the khaki shirt counter you climb over a mountain of petticoats, burrow through a field of socks and make an offer of five rupees. The shirt is marked seven rupees. You win.

The return journey is via a tunnel of topis and a lake of babies' underwear, and you emerge triumphant with nothing worse than a skinned elbow.

On the verandah you wrap the shirt in an old *Pioneer* brought for the purpose, and wend your way back to the Mess for a much-needed glass of water.

In the course of the following week you remember you haven't paid for the shirt, so you go back, negotiate a park of perambulators and discover the pay desk. This part of the establishment also serves as a stall for the fat Brahmin bull to whom Ganesh Lall and Sons owe their protection and prosperity.

You are now the proud possessor of a debt-free conscience and a new khaki shirt. What boots it that the bull stood on your hat and that your stick and gloves have been for ever lost?

Residents of 'Pindi develop the Ganesh Lall habit and, as a result, are formidable opponents in every obstacle race throughout the mofussil.

(f) Migrants. Everybody in 'Pindi is *en route* to Murree, Kashmir, Dera Ismail Khan or Lahore. This includes all permanent residents, for nobody of any consequence ever admits that he is rooted in 'Pindi. There is no reason why he shouldn't; it's quite a nice place; but one must be in the fashion. . . .

Here endeth the fifth day. But please don't imagine we intend to stay in 'Pindi for more than twenty-four hours. Oh dear no! *We are only passing through.*

L'Oiseau Rouge is burnished and tuned up. So are we. On the seventh day out from Parachinar we set off for Lahore.

The long journey of 171 miles was rather hot and dusty, especially the latter half. In India we found that, as a rule, a stretch of 120 miles per day was the limit of comfortable and interesting motoring.

The scenery on the road from 'Pindi to Jhelum is attractive. Red and black volcanic hills, green valleys smiling under their young crops, and sturdy peasantry busily employed on their lawful occasions.

The Hop visibly swelled with pride.

Jhelum has :—

(a) A narrow golf course on the banks of the river. There is no sale for anything but "floaters" here.

(b) Narrow roads through cantonments. They are lined with beautiful flowering shrubs and fine trees.

(c) A long, narrow dāk bungalow, of which more anon.

The river is crossed by a very long bridge, and we pass in succession the picturesque towns of Gujrat, Wazirabad and Gujranwala.

The whole of this district is agricultural and, in this respect, one of the most fertile and richest parts of the Punjab. Next to agriculture, history figures prominently in the landscape.

At Rewat an ancient fort within whose walls rests the body of the last great Gujar chief, killed in battle near by.

All along the G.T.R. the remains of old Moghul castles and strongholds ; ornate, solid, immense.

Here and there rises an early Buddhist mound ; or the dome of a stately Mahomedan mausoleum surmounts the green branches of its protecting screen of trees.

Gujrat and Wazirabad still show traces of their old defence works. The swords have become ploughshares or pens, and the battlements are in ruins ; but it requires little imagination to conjure up those brave days of old.

Longfellow says that " Next to the Alhambra of Granada, the Schloss of Heidelberg is the finest mediæval ruin in Europe." I have not seen the former but, in my humble opinion, the latter—beautiful as it is—falls far short of India's mediæval remains in the way of princely grandeur and magnificence.

In the case of many of the finest Moghul buildings, Italian and other European workmen designed and executed the best portions. Still, credit is due to their Indian employers who initiated the work and provided the means for carrying it out.

The forts in Delhi and Agra—wonderful ! Fatehpur Sikri—glorious ! The Taj Mahal—marvellous ! But each to his taste. If a dozen different people were asked : " What impresses you most in India ? " the answers would run something after this fashion :—

- (1) The first week in July.
- (2) The eternal snows.
- (3) The excellence of the servants.
- (4) The shortcomings of the servants.
- (5) Medical Inspection Room at 5.45 a.m.
- (6) The Club at 7 p.m.
- (7) The bedding bundle.
- (8) The " Not at Home " box.
- (9) The fact that, in practice, 1s. is the same as R. 1.
- (10) The morals of the man who has a pony to sell.
- (11) The total absence of music.
- (12) The button that the dhobi failed to smash.

Georgina's answer is worth recording. She says, " Mr. Kipling's powers of imagination when he wrote ' Plain Tales from the Hills.' "

The Hop is torn between " Walyiti dawai " (European medicine) and " Rassad," the extra penny a day he gets when travelling.

I think I'd plump for the Taj.

The following appears in a recent number of the Journal concerning a visit to the Taj :—

I am sorry to say I was sadly disappointed. . . . It was certainly a very pretty sight.

Quite so. Each to his taste. But PRETTY—*pretty* ! Well, perhaps the writer of the above quotation will be forgiven. I hope so. We are a charitable people.

Lahore at last! and while The Hop is fetching tea and preparing the baths, we may recite some of the attractions of the capital of the Punjab :—

(a) The Museum where Kipling senior was curator and, in front of it, the big gun from which Kim shouted defiance at the passing show.

(b) The School of Art with its adjoining sale-room ; the best place in which to purchase Christmas gifts outside London.

(c) A tea shop which looks like the interior of a submarine. This is due to an Italian machine, nickel-plated and covered with levers, springs, pistons, gauges, governors, whistles, safety valves, and goodness knows what else besides. It provides automatically one hundred and one different kinds of drinks. You merely press one of the one hundred and one buttons—the appropriate button of course—to get what you want immediately. I'd rather be button presser in that shop for twenty-four hours than be Mussolini for the rest of my life ; but it must entail a long and arduous apprenticeship.

(d) Lahore Cantonment. This was the site of the great waterless experiment of 1904, referred to in the Journal of March of this year. Many people—laymen—regard this as a sinister medical joke. I have good, indeed the highest, authority for stating now that it was not a joke.

While on the subject of that delectable spot once known as Mian Mir mention must be made of :—

(i) A number of bungalows which were erected in the time of Clive or thereabouts, and which have not been renovated since. Excellent examples of the accommodation once enjoyed by our great-great-grandfathers. Their great-great-grandsons don't enjoy it so much.

(ii) The fine church.

(iii) The well-stocked cemetery.

And so, mournfully, to the end of the sixth day.

Up betimes.

L'Oiseau Rouge speeds through a country which is green in tracts only. These tracts are desert colonies, the result of extensive canal irrigation.

Once again—how difficult to answer the question “What impresses you most in India?”

Here it is : This wonderful bridge which carries you over this mighty river.

No! here it is: This immensely-long, life-giving canal, with its thousands of off-shoots and millions of acres dependent on its bounty.

Finally, one despairs of a solution and clutches gratefully at the suggestion that the Taj is certainly a pretty sight.' . . .

Yesterday we ran through the old home of the Gujars. Akbar conquered this once-powerful race, built a fort at Gujrat and forced them to settle down. But their nomadic habits are ineradicable and, to this day,



their lives are spent in continual journeyings. The Jats are now the permanent occupiers of the old Gujar reservation.

To-day we traverse the heart of the country of the Sikhs. Closely allied to the Jats but more aggressive, martially inclined and ten times more pig-headed.

Once a Sikh makes up his mind, that's the end on't; either bow down to the inevitable, or kill him. It's waste of time to argue with the hind leg of a mule.

This piece of doggerel (author unknown) describes our long-haired friend fairly accurately :—

A Gurkha in a gully and a Dograin in a charge,  
An Afridi in a hand-to-hand; and when there's a barrage  
A P.M. holds his ground like any leopard in his lair :  
The only thing that's lacking is a little bit o' hair.

So when there's mud and blood and bones and nobody is nigh  
To come to your assistance, and there's nothing left but die—  
O! give to me a company that ain't shook by knocks,  
I.e., the donkey stick-it-outs who never trim their locks.

Anti-vaccinationists and people of that kind are as dough compared with the Sikh when he's up against it; and it is this trait which endows any Sikh trouble with peculiar difficulties.

On the other hand, the P.M., i.e., the Punjabi Mussulman, is a reasonable being possessed of a fund of humour and common sense. This example of the great Law of Compensation has been a blessing for the Punjab.

We are nearing the time of the important Hindu festival called The Holi, and *L'Oiseau Rouge* passes one family party after another; some on foot, others in light carts drawn by little trotting bullocks. They are making for the towns, or visiting relations in the neighbourhood. Everywhere the holiday spirit is abroad; gay dresses, pounds of jewellery, music, laughing eyes and light hearts. The whole countryside seems to be flowing along its one great artery.

One hundred and twenty-six miles from Lahore and we enter Ludhiana on the Sutlej.

As everyone knows, "Punjab" means "The land of the five rivers."

*L'Oiseau Rouge* has by this time crossed all five streams—the Indus, Jhelum, Chenab, Ravi and Sutlej.

Ludhiana is known by repute to all who have served in India, but few have ever been in the place. It is known by repute because each of its 500-odd merchants possesses an Indian Army List—not always up to date—with the aid of which the said merchants deluge every cantonment in India with postcards every week. The postcards advertise Corps buttons, badges, pugri bands, ties, etc., etc.

When we reached Ludhiana we found it to be a place of :—

(a) Factories and railways, dismal and drab.

(b) Indian officials ; Commissioner, judge, policeman—all Indian.

“ Ah,” said Georgina, unabashed, “ but the doctor ? ”

“ Kala bhi ” replied the impassive khansamah of the dāk bungalow.

In the evening The Hop hazarded the remark that this was a “ Bahut afsos bat ” ; we pretended we didn’t hear. All the same he knew we did, and sympathized, poor chap ! No one dislikes Indianization more than the good, old-fashioned servant ; and it isn’t altogether a question of pay ; not by any manner of means.

(c) Post offices : presumably for the sale of postcards on a colossal scale.

To be quite frank—we didn’t like Ludhiana ; it wasn’t even “ a pretty sight.”

The eighth day of the trip was more exciting than pleasant. For the most part the road lay through sandy wastes. A hot, dry wind was blowing. The sand covered the road in swirls and eddies, so that at times it was most difficult to keep L’Oiseau Rouge on the fairway. Great clouds of fine grit darkened the sky ; dust filled our eyes, ears and nostrils, and speed was reduced to a walking pace. We saw little of man or beast, and prayed for immunity against punctures and breakdowns.

Allah be praised ! L’Oiseau Rouge weathered the storm even better than we did.

Ambala was the first port of call. Here we loaded petrol, and eatables for the usual roadside tiffin, and discussed with a friendly babu the bad state of the cantonment roads. He said : “ But now, sâar, you have no cantonment magistrate, sahib. He is demised. The new cantonment executive officer being small fry is likely not to make roads pukka for all-round policies of economics and retrenchments without doubt.” Then he added, reflectively : “ He is owner of new motor car, nevertheless ; therefore contracts may issue for necessary action without further delays.” We agreed.

Ambala contains two important headquarters :—

(a) Headquarters R.A.F. By the time this is published it may no longer be true. Rumour moves these headquarters elsewhere once a quarter. However, it may be worth recording as a historical fact that these headquarters were in Ambala when we were there.

(b) Headquarters Army Physical Training (North). This is a curious institution where officers and men, British and Indian, are taught :—

(i) The Swedish system of physical training as modified by the pundit of the British Army. Very much modified, let it be said. So modified, indeed, that it is now called the British Army system of physical training. This change of nomenclature is, so far as I know, the only compliment paid by us to the

memory of Ling. It cannot be said that we have paid our debt with interest.

- (ii) Oranges and lemons, broken bridges falling down, kiss-in-the-ring, and similar strenuous and exciting pastimes. This method of keeping young—or, one might say, infantile—seems to have no counterpart in adult civilian life; an unusual circumstance in our comparatively democratic little Army.

On through the storm to Sirhind, a picturesque and historical place. But by this time one's vision and memory are so clogged with dust and sand that there is nothing for it but to hurry on. The storm subsides as we enter Karnal at the end of 119 miles, most of which have been done under very trying conditions.

The present-day soldier knows little or nothing of Karnal, and yet it is a place teeming with interest; and, to be quite honest, we knew nothing about it until after tea, when we set out from the dāk-bungalow to explore.

Our first find was an old gentleman in shooting kit, with a pack of well-bred setters and spaniels. He was most kind and informative, and the rest was easy.

(a) Visit the old British cemetery first. The monuments are stupendous and hideous. The graves are numerous and date from 1800 to 1840. As is usual in these old cemeteries, women and children form a large proportion of the dead; a very different story from the one to be read in our modern resting-places in India.

(b) Then visit the new cemetery; 1840 onwards. This is on the G.T.R., a little over a mile west of the station. It is quiet, green and shady, and once formed the compound of the big church. Of the latter, only the tower now remains.

(c) Next look at the old bungalows—mostly ruins—which used to be occupied by the head military and civil officers. These are, or were, miniature palaces. In the old days our prestige could not have suffered on the score of inadequate housing, at any rate.

Georgina and I had heard of such places. In foolish moments we may even have dreamed of living in them. But here they were in brick and stone; not Rajah Birsingh's nor Nawab Ali Khan's, but General Auchterlony's and Major Sam Browne's and Apothecary Tom Smith's, all of H.M.'s Horse, Foot, or Guns, or of the H.E.I.C.'s factors and forces.

Georgina and I thought of No. 22 Cantonments, Kohat, and promptly broke the tenth commandment.

(d) Finally, look at the wide avenues, the big parade grounds, the open spaces everywhere shaded by towering trees, and you will easily conjure up a vision of our old frontier station over against the Sikhs. It must have been a place worthy of its importance in those days of adventure and strife.

However, let us not complain. The wave has rolled westwards.

Karnal has been left far behind, and in its place we have gained Bannu and D.I.K.

Yes—we have gained Bannu and D.I.K. . . .

On the ninth day to Delhi, seventy-five miles.

Now we are on the old-established part of the G.T.R. I believe it is haunted. It has an aged appearance and a musty mediæval air. Ghosts may be seen, even in broad daylight.

You approach a string of bullock carts but, as you peer through their cloud of dust, is it merely a string of carts you see? Not at all; certainly not at first.

No. You envisage an old muzzle-loading battery on the march. On each side a line of red-coated infantry. At the head of the column a palanquin, carried by eight lusty cahars. Inside the palanquin an officer shaking with ague. One of the escort is heard to say to a pal, "Three brandy pawnees in an hour and 'es still shakin.' Got it bad this time."

Of course the vision scatters as you clear the dust cloud, but a smell of curry far more pungent than the 1926 variety remains.

Or you pass an old staging bungalow with its high walls and flanking, loop-holed towers. The G.T.R. is dotted with these places, now converted into police picquets, revenue offices, post offices, and so on.

If only their walls could speak. . . .

But no matter: *What do you see?*

Why, you see a white woman ride in at the gate. Behind her comes a baby in a dhooli and then a crowd of thirty or forty servants and retainers. Her husband is in the big camping ground on the opposite side of the road, struggling with commissariat camels, kanats and cholera.

Twilight approaches and L'Oiseau Rouge ploughs her way through phantom cohorts of yellow-turbaned Khalsas; on through russet-complexioned Pathans from the west; through Akbar's glittering hosts and the cruel Tartar conquerors. Finally a well-disciplined, sturdy little army comes swinging along at the end of this marvellous procession. The men are white; the officers are white; the leader is white—Alexander the Great!

Do you know what will happen if you fall asleep at the wheel?

Tut-tut! this won't do!

Nevertheless, the G.T.R. *is* haunted.

Panipat! *The* battle-ground of Northern India. Here, in 1526, Ibrahim Lodi was defeated by Babar. In 1556 Akbar defeated Adil Shah's Hindu general Hirnu. And in 1761 Ahmad Shah defeated the Mahrattas. Each of these was a great and decisive victory which settled the fate of Hindustan for the time being.

The chief monument of antiquity is the tomb of the Mahomedan saint, Kalandar.

Panipat, in common with Calcutta and Kohat, has recently been the scene of some serious communal rioting.

L'Oiseau Rouge is now nearing Delhi, and here we leave the Punjab. Delhi is now cut off from that province and forms a small province of its own; the Delhi Enclave.

When Georgina and I were young we had the good fortune to be at the 1911 Durbar. We remained there for six weeks, with not too much to do, and so we came to know the place fairly well.

Fifteen years ago. Heavens—what a change!

We failed completely to recognize the old landmarks; lost our way; ran into New Delhi (Raisina) and took over an hour to extricate ourselves. A gigantic maze.

Delhi cannot possibly be described in a few paragraphs. Some day I'll write a three-decker guide to the place. As a matter of fact several good guide-books exist now, but they are more or less unsatisfying. You find no mention, for instance, of the following:—

(a) The smells of the Chandni Chowk; admittedly a difficult subject to tackle, but surely someone of an analytical turn of mind might try.

(b) Baker's ovens. This is the name which has been given to the bungalows at Raisina designed by Mr. Baker. We express no opinion on the suitability or otherwise of this appellation; but we *do* protest against an assertion made in a recent number of the *Times* by an official who had spent fifteen years in Delhi. This gentleman declared that Delhi was uncomfortable for two months in the year only; and that even then it wasn't too bad. If ever Georgina meets that man. . . .

(c) American tourists. They swarmed over our hotel. The men wore white duck plus-fours kept in position by half-inch leather belts which *must* have been strong despite their flimsy look. The women wore navy blue sun-veils to protect the posterior cervical region, and stockings of the Rob Roy tartan pattern. They were a cheerful crowd—or bunch.

I accidentally stumbled on one son of the Land of Liberty who had been engaged in an intensive study of the theory and practice of anti-prohibition. For the sake of safe custody an American medico had confined him to an English-type porcelain bath—dry, of course. In consequence of this I missed my tub; but I felt I had gained in my knowledge of sociology.

(d) Wembley plus the White City multiplied ten times, i.e., Raisina. The guide-books do mention this place, but they don't tell you how to find the switchback and the rumble-tumble lighthouse.

(e) How to climb the steps of the Jumma Masjid without slipping on the orange peel.

(f) The cost of trying to—no! not live; exist—and a heap of other things besides. If you aren't ruined before the expiry of a couple of hours, go and view John Nicholson's statue. It is backed by the Kashmir Gate. That sight quickens your pulse and makes you square your shoulders. Then pass through the gate and into the compound of the Skinner Memorial Church, and look at the shot-riddled globe which bore the cross on the Mutiny church. Read the pathetic tablets on the walls within. Raisina has nothing like *that*.

Georgina and I spent two delightful and expensive days in revisiting the old scenes.

The Hop made up leeway on account of several unsatisfactory rotikhanas encountered *en route*.

L'Oiseau Rouge received a thorough spring cleaning.

On the twelfth day we left the G.T.R. and ran down the southern salient of the United Provinces of Agra and Oudh.

The drive to Agra was lovely. A cool breeze and a clear sky. A fine road, magnificent trees, bountiful rivers and canals, and a hundred and one sights of beauty and interest.

The country people were still holidaying. Carts, camels and elephants streamed along the road with loads of gaily-dressed women and children, attended by their swaggering men-folk. Colour, jewellery, song and chaff; a merry throng indeed.

Georgina photographed an elephant in war paint, and was duly and most impressively salaamed by Jumbo as well as by his mahout.

Even Nature seemed to be *en fête*. Peacocks in the fields, monkeys in the trees and black buck scampering over the plain.

At Bulandshahr a big mela was in progress; quite like a fair at home. Roundabouts, swings, cocoanut shies, a circus, and gipsies galore. In fact, the only thing we didn't see was an English Punch and Judy show.

Presently we skirt Aligarh. This is only the name of the fort; the name of the city is Koil. It is a Mahomedan centre, and here, at the Moharram, takes place the sword dance of the Indrakotis. The dancers number 100 to 150 men and the spectacle is exciting.

Ludhiana for badges and buttons, Aligarh for padlocks. On arrival in India the best people send to Aligarh for a set of one dozen locks. Each lock has two keys. The keys of one lock cannot open any other lock. Each set of locks is provided with two master keys. These are kept by the head of the house, who then distributes the padlocks and keys thus:—

(1)	To khansamah	..	for kitchen..	..	..	1
			,, kitchen cupboard	..	..	1
			,, dhooli ..	..	..	1
(2)	,, khidmutgar	..	,, bottle-khana	..	..	1
			,, ice-chest	..	..	1
(3)	,, bearer	..	,, front door	..	..	1
			,, lamp-room	..	..	1
(4)	,, dhobi ..	..	,, drying-room	..	..	1
(5)	,, sals ..	..	,, grain godown	..	..	1
(6)	,, mali ..	..	,, garden godown	..	..	1
(7)	,, sweeper	..	,, hen-house	..	..	1
(8)	,, motor-wala	..	,, car godown	..	..	1

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You are thus left without any locks for your own cupboards and wardrobes, so you send to Aligahr for half a dozen more.

On the following day you discover that the dhobi can't open the drying room. He can, however, open the hen-house.

Then, can the sweeper open the drying-room? Not at all. He can't open anything. He has lost his keys, and the dhobi's as well.

This is where the master keys come in; but after an hour's work Georgina finds that although she can open the ice-chest, she can't open anything else.

The khidmutgar then appears and asks for Walyiti dawai. On cross-examination you discover that he wants castor-oil for his youngest, aged  $2\frac{1}{2}$ , who has just swallowed the key of the bottle-khana.

The permutations and combinations of which these locks and keys are capable far surpass anything dreamed of in advanced algebra.

Aligarh is, of course, a prosperous city.

After registering 134 miles we entered the city of Agra. It was dusk. One of the local intelligentsia approaches on a cycle. I stop him.

"Will you please tell me the nearest way to cantonments?"

"Certainly sār; follow me, if you please."

We follow him. Yes, I bought it.

Through densely packed bazaars, round sharp corners, in and out amongst the barrows, bullocks, babies and badmashes we follow him.

Down dark, evil-smelling lanes; out into the glare of the paraffin flares of the booths; past mosques, temples, zenanas and zelots we trundle on, ever following him, *but never overtaking him*. Every now and again he turns his head and waves us on.

The Hop says nothing, but he is moody and restless.

Georgina, with her usual child-like faith in humanity, keeps me in the fiend's tracks.

By this time the speedometer has registered another six miles, and my temper is registering something over boiling-point. I pull up alongside the first policeman I can find; Intelligentsia-on-a-cycle puts on speed and darts down a side alley. A few words with Robert, and in five minutes we are inside the cantonment boundary. May Allah pull every hair out of that young man's beard; may his cycle be the death of his sister-in-law and his intelligensic brain be thrown to the dogs of his own sadhus!

Like Delhi, Agra was another of our old haunts, so we remained there for a day—the thirteenth of the trip.

The writer in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS for March omits to mention:—

(a) The Club's cuisine, and its famous breakfast melons. You enter the dining-room at 9 a.m. of a July morning. True, you have bathed and changed; nevertheless, you are weary and jaded after a sleepless night, and a strenuous morning's work which began at 5.45 a.m. You seat yourself at the table, and there is placed before you a wondrous object. It is a whole, large-sized, salmon-coloured melon, within which is tucked away a big chunk of ice. After negotiating this you tackle porridge, fish, eggs and bacon, tea, coffee, bread, butter, jam and marmalade; a brazen sky, a brazen C.O., mosquitoes, scorpions, box-walas and any other kind of obnoxiousness which may come along. The Agra Club melon has made many a man.

(b) The old-fashioned air of the place. Agra contains many Vieyras, Da Silvas, D'Souzas and Gills.

The bungalows are very Indian in design, and the gardens are pretty and formal.

Were this cantonment in England it would certainly smell of lavender and thyme and grow fuchsias. But, alas! there is no place here for the home-bred honey-bee. There are, however, a certain number of anopheline, and they are quite good suckers.

(c) The moon. The special Agra moon. It's no use querying this. If there were not a special Agra moon, how then could the Taj be transformed, as it is in fact transformed, into Fairyland? Not the fairyland of pantomime or Grimm's Tales, but real Fairyland. Some day the astronomers will waken up and investigate and, as usual, the glory of the discovery will go to the wrong man. Meanwhile, enough for me that I *know* there is a special Agra moon. The practical Georgina believes in it too, and even the utterly unromantic Hop has never said me nay.

On the fourteenth day we set out for Fatehpur Sikri. This was a veritable triumphal progress.

Foot police lined the road on both sides, and picquets of mounted police were stationed at regular intervals of about 300 yards.

None but privileged traffic was allowed on the King-Emperor's highway.

L'Oiseau Rouge was part of the privileged traffic. Fortunately I succeeded in disguising my amazement; Georgina's unfailing presence of mind stood the test, and The Hop's oriental calm completed our unconscious bluff. L'Oiseau Rouge, all shining and bright, also played her part. Had it not been for this quadruple defence we should probably have been held up for half a day.

Never, in the whole course of my service, have I suffered from such a barrage of saluting; twenty solid miles of it. And such saluting, too! Even more punctilious than the brand cultivated by the German point-duty policeman, and that's saying a good deal.

At the very outset Georgina and The Hop sat up and took notice. That produced a marked effect on the police, and incidentally, and by repercussion, on me.

The course of events, by stages, may be tabulated thus:—

Miles	Attitudes		Mode of salutation by police	Effect on me
	Georgina's	The Hop's		
2	Gracious and smiling	Interested	Formal	Driving with difficulty
4	Dignified	Amused	Very precise	Driving and saluting with difficulty
6	Majestic	Gratified	With fervour	Driving to the danger of the public
8	<i>Très distinguée</i>	<i>Blasé</i>	Fervour redoubled	Exhausted



This incident illustrates the blessing of a spare driver. At the end of the eighth mile I induced Georgina to relieve me at the wheel, and was thereby enabled to perform perpetual-motion saluting with the dignity befitting the occasion, and with less risk and fatigue.

On the previous evening we had seen H.E. The Viceroy in the Taj Gardens. When we arrived at Fatehpur Sikri we found him there.

Never in my wildest dreams—not even when I have heard The Hop pray that some day I might become a “lat sahib”—have I imagined that, throughout one glorious hour, the whole of the constabulary of the United Provinces of Agra and Oudh would treat us as high personages on the staff of the Chief of the Heaven-Born. And yet it happened. Once again is truth stranger than fiction.

Fatehpur Sikri is a difficult place to describe. It is one of the old capitals of the Moghuls.

A palace-fort was built on a hill; a city grew up around it; and a big, artificial lake was made on the arid plain near by.

The arid plain remains; the lake has gone; the city is empty and crumbling; the palace-fort still stands testimony to its clever architects and dexterous builders.

The place was occupied for a period hardly longer than that taken to construct it. The real reason for its desertion is uncertain, though several alleged reasons exist.

Some say it was forsaken for no good reason; an oriental despot's caprice. Others say that the chief mullah advised its abandonment on account of occult warnings. Others again aver that malaria was so extensive and virulent that the place became uninhabitable.

Much of the design is pleasing and the workmanship is intricate and fine. The grace, stateliness and utter desolation are very impressive and pathetic. It is as if you were looking at a marble effigy in which the sculptor had contrived to imprison the soul of a beautiful woman.

The main courtyard contains a masterpiece; the tomb of Akbar's beloved mullah, Salim Chisti. This priest was a true saint; a man of unblemished character, upright, loyal and selfless.

One departs from Fatehpur Sikri satisfied, but chastened. . . .

*L'Oiseau Rouge* carries us back to Karaoli (thank goodness the police bugles have sounded the dispersal!), and thence by a rough country road to Achnera. At the end of about thirty miles we crossed the border and entered the State of Bharatpur in the Rajputana Agency. Total distance, 1,160 miles.

Here we halted for a moment to explain the position to The Hop. Of course he remained impassive, but his comment was: “Then to-morrow we shall surely see the big ships in Bombay. Truly wonderful are the powers of the motor car of Your Highnesses, who are ever renowned as the unfailing Protectors of the Poor.”

*(To be continued.)*

## NOTES ON A TOUR THROUGH WAZIRISTAN.

BY MAJOR A. D. STIRLING, D.S.O.

*Royal Army Medical Corps.*

*March 6, 1926.*—We left Rawalpindi at 8.10 p.m., some forty minutes late, by the train which runs to Kohat and Mari Indus, the line to Kohat branching off at Jand Junction. The day had been fine in Pindi and the evening was not too cold. The forty minutes' delay in starting does not matter on this line, where the allowance of time is very liberal, and even two hours could be made up on the journey. We were four in the compartment, rather a small size, of the type universal on Indian railways. All of us were in the Army, as is the rule on railways running to the North-West Frontier Province; three of us bound for Bunnu and the other for an intermediate station.

The night passed fairly comfortably, sleep being frequently disturbed by numerous stops, at each of which there was the invariable shouting by the native population which seems to crowd at every station and into every train. One never sees a third-class compartment on an Indian train that is not packed with humanity.

At 7 a.m. on a gloriously fine morning we arrived at Mari Indus, a most forsaken-looking place, and were met by the Station Staff Officer, who had arranged with the stationmaster for an excellent breakfast, to which we did full justice. After that we crossed the Indus in the official launch, which took us very comfortably over to Kalabagh Ghat. In the ordinary course one crosses in the ferry boat, which has a barge alongside conveying five railway wagons (narrow gauge). It seemed strange to meet a train ferry in such a remote part of the world. We had about half an hour to wait at Kalabagh before leaving for Bunnu. During this time it was very interesting to see the wagons being hauled up by cable on to the permanent way.

It is interesting to note that the ferry boat in question was Paddle Ambulance No. 54, which was in use on the Tigris during the war in Mesopotamia.

Another interesting sight was the nest of a kite built on the masthead of the ferry boat, which could only occur in India; we saw the bird alight on the nest whilst disembarkation was going on.

We left about 9 a.m. in an old-fashioned tiny railway compartment, with little room for even light hand-baggage; the whole train looked as if it had been recovered from a scrapheap, and I shuddered to think what a journey in the hot weather would be like—it was bad enough on a cool day. We managed to get lunch, quite a passable one, at Laki Marwat, and then continued our journey. The scenery all along suggested an uninhabitable country—dusty and barren—whose inhabitants did not

inspire us with confidence, evil-looking people who would murder one without a thought. As we neared Bunnu, however, there was a distinct change in the scenery as the result of irrigation. Everything looked green and flourishing, and there were signs of trade at the various stations passed.

Bunnu was reached about 5 p.m., and very comfortable arrangements had been made for our accommodation with brother officers. Cars were waiting and soon we were in a pleasant bungalow, where we removed the traces of a very dusty journey.

Bunnu is extremely pretty, with well laid-out gardens and fine trees, and at this period beautiful flowers. It is, of course, surrounded by



FIG. 1.—Ferry boat at Kalabagh Ghat. The old Paddle Ambulance No. 54 used on the Tigris.

barbed wire to prevent wild Afridis and others from getting in easily to commit murder in order to get rifles. As it is they still occasionally succeed, as the frontier is only some five miles distant, and they come to study every movement for weeks before making a raid.

That night (March 7) we dined in the I.M.S. mess, the only one of its kind, I believe, in India; the evening was most enjoyable, and we had good musical selections by the Police Band. Other guests were the Brigade Staff, the officers commanding regiments in the station, and the police officer who went to the rescue of Mollie Ellis, who was carried off from Kohat by the notorious brigand Sultan Mir, after her mother had been killed in her presence. He was a very interesting Indian officer who seemed to have no worries and proved good company.

Next day we spent in inspection of all units in the area. They are rather confined as all must be within the wire. Everyone, however, seemed to be very happy, and there was an atmosphere of friendliness often absent in the bigger stations. That evening at dinner with the Brigade Commander, a very genial Irishman, we met a lady doctor attached to a mission, who had been doing wonderful work in Bunnu for over two years without a break. She was very cheery and seemed to be absolutely at home, although she had to go with an escort everywhere after dark. On returning

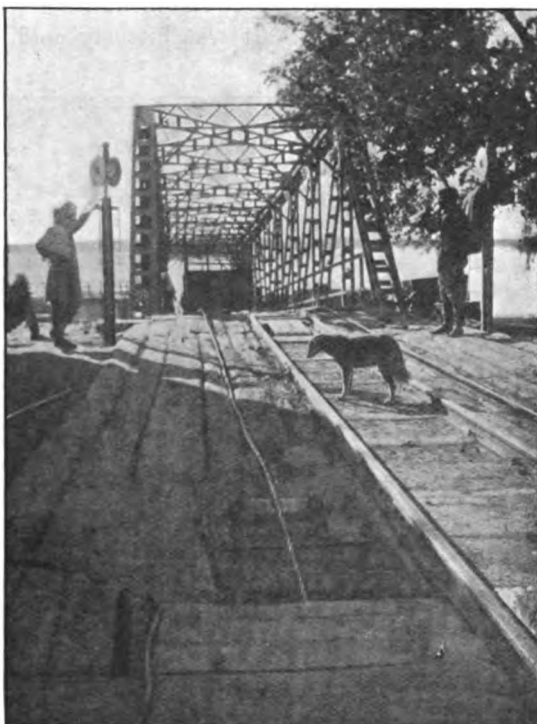


FIG. 2.—Wagons being hauled up from the Train Ferry at Kalabagh Ghat.

to the bungalow we were met by the chowkidar, a formidable looking man, with a weapon very much resembling a sickle with a long, straight handle, which he grasped—the blade gleaming in the light. A sudden end awaited anyone who tried to break into the bungalow.

*March 9.*—We left Bunnu at 8.30 a.m. *en route* for Razani. The outpost of Saidgi was reached about half an hour later; here a company of a Punjabi Regiment is located for road protection duty. Next we came to Idak, an important post where a company of mechanical transport is stationed; this assures the conveyance of supplies for the troops farther up the line as far as Razmak. The whole country presents a most barren and desolate

appearance; the road rises steadily amid hilly surroundings, and only here and there is there the slightest sign of any vegetation. Dumdil was reached about noon; here an Indian infantry regiment is stationed in a camp pitched on the side of a hill, the whole like every camp in Waziristan, enclosed in barbed wire. Outpost and road protection form the main duties.

At 1.30 p.m. we reached Razani where we were to spend the night. We were accommodated in tents with primitive furniture, reminding one of a state of war; we messed in the Brigade mess, where one was very comfortable. This is an important station right amongst the hills, several of the low ones being snowcapped. It was bitterly cold, and we came in



FIG. 3.—Brigade Headquarters, Razmak.

for heavy rain which made things uncomfortable. The afternoon was spent in going round the lines, a station for Indian infantry with a detachment of armoured cars. This section had only arrived that day; we met the outgoing detachment on the way up, quite an impressive sight. Razani is some fifty-seven miles from Bunnu. The Brigade Staff were very hospitable and made us feel quite at home during the short stay.

Next morning we left at 9 a.m. for Razmak, a distance of about seventeen miles, and this part of the road was much more interesting; there was a certain amount of vegetation, and the road made a gradual ascent by a circuitous route, and then a slight descent to Razmak, which appeared in the distance to be quite an important place, much larger than any of the others seen previously. On the way we encountered the up-going convoy which had halted at Razani for the night.

Later we met the down-going convoy which made progress slow for a time; we also met several private cars with officers bound for the United Kingdom on long leave, and very happy they looked on their journey back to civilization. A good many olive trees were visible along the road, a great change from lower down. Wherever there was cultivation there was a watch tower where men kept guard, all well armed with rifles; this is necessary to protect their fellow men who desire to live a life of industry and peace. An interesting feature was noticed—one which is seen all over India—wherever a cutting is made a mound is left to show the amount of work done—people do not trust one another very far in this country.

Razmak was reached at 10.10 a.m., where we were met by the Brigade

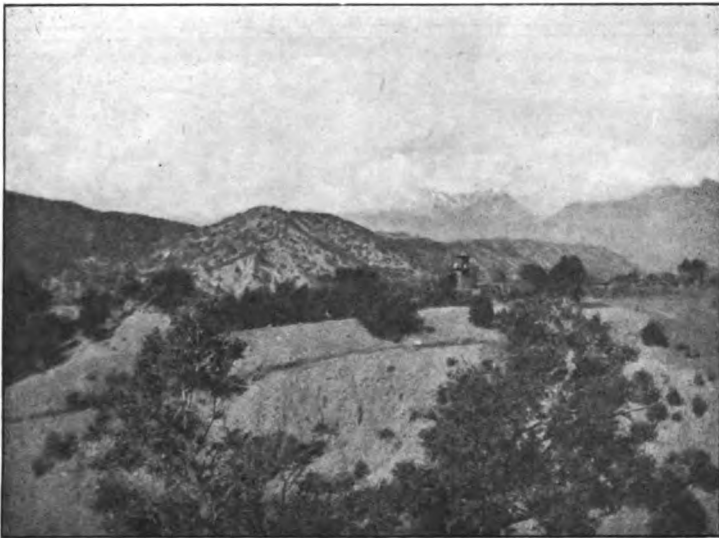


FIG. 4.—View in Southern Waziristan showing a watch tower.

Commander, a very nice and efficient officer. This is an important station with some 10,000 troops (British and Indian). One was impressed on arrival by rather an imposing building with a large clock on the central tower, and a fine entrance gate with stone posts surmounted by lamps of a mayoral type. This is the Station Mess, portion of which is used as the club.

The day was spent in going round the various units in the area, most of which are accommodated in fine buildings, all of which give the impression that one has come to stay. Razmak is quite a town and progress is rapid. Even the bunia shops look quite different from what one finds elsewhere: they are all in good buildings and have to conform strictly to the rules in force in the station as regards sanitation and cleanliness. There can be few stations in India where such a standard can be attained, as in almost

every other the bunia shops have been in existence since before the birth of the vast majority of officers now serving.

Near Razmak is the boundary between the Wazirs and the Mahsuds ; this was recently more clearly defined to prevent the interminable squabbles which used to occur, and in all likelihood will recur. As in the rest of India the British act as the buffer, and were the troops not present there would be unceasing war. In a recent encounter between some 500 Mahsuds and some 1,500 Wazirs, shooting was being freely indulged in, when the political officer of the area came on the scene and boldly ascended a hill on which the Wazirs were located, with bullets flying around him, and succeeded in bringing hostilities to an end. This dispute was over the boundary question, and the settlement was a fine example of British



FIG. 5.—Crossing a ford in Southern Waziristan.

pluck. The night was spent in comfortable quarters, and we lived in the nice Brigade Mess. Just above the Mess the mountains were tipped with snow.

That day we had tea with the Bombay Pioneers in their comfortable Mess just outside the main camp. The building bore evidence of the work of the pioneers : it had very nicely carved mantelpieces, which reminded one of home, while the steps leading up were well arranged.

*Thursday, March 11.*—We left at 9 a.m. by the circular road on our journey to Manzai. The road was most interesting, first through bleak mountain valleys, and later through a pretty narrow river valley, reminding one very much of Scotland.

There were numerous green patches along the river side and the view

from the winding road was delightful. All along the road were the Khassidars, local Mahsuds who are paid by Government to keep watch on the road during the day. They provide their own rifles, and in addition are usually armed with two nasty-looking knives which they would not hesitate to use in case of need. They appeared quite friendly but were undemonstrative although taking full stock of every passer-by. They were of all ages, some extremely youthful, who seemed hardly strong enough to carry a rifle. A majority of them salaamed respectfully.

One travels armed on this road, but the arms which would prove a strong incentive to attack are always carefully concealed. The sentries on bridges and on posts on the road are unarmed, as *they* would most certainly be attacked for their rifles.



FIG. 6.—Bridge of Boats across the Indus at Dera Ismail Khan.

Enormous black ravens were seen all along the road and struck one as being handsome birds after the ordinary crows which swarm everywhere else.

One striking feature along the valley was the curiously twisted rock strata, bent round in all directions like a stick of candy. They made one think of the enormous force that produced the distortion which was quite remarkable.

We passed through Sararogha and Jandola, two of the posts occupied by the South Waziristan Scouts, both of them fenced in with the usual barbed wire; the men looked fit and martial; they lead a strenuous life and are very efficient.

About 12.30 we reached the outpost of Khirgi where a company of a



regiment stationed at Manzai is always located. It is a desolate-looking place which must be blazing hot in the summer. Manzai was reached at 1 o'clock, and after getting settled in our quarters we enjoyed an excellent lunch in the Medical Mess (combined R.A.M.C. and I.M.S.). Thereafter we met the Brigade Commander, an old friend of mine, and then went round the lines. There are only some five buildings in the camp at present, but the lay-out of a "Brighter Manzai" has already been planned. The camp is a most barren one with hardly a trace of vegetation of any sort. It is of course surrounded by wire and is as a rule very dusty, and in the summer extremely hot. The site is a strategical one and is likely to be permanent, so that in a year or two there should be much more comfort than at present.

During the afternoon a section of armoured cars came into camp having come from Razani; they patrol the road at irregular times so as to impress the local inhabitants and to dissuade them from feeling belligerent.

That night we dined with the Brigade Commander and passed a pleasant evening in a cheery party, finishing with a sing-song. They do everything to dispel boredom at Manzai.

*March 12.*—After a very wet early morning we left Manzai at 9 a.m., for Tonk and Dera Ismail Khan, always referred to as D.I.K. This run is one of some sixty-two miles, over quite a fair road and in parts near D.I.K. a very good one indeed. The descent is gradual through fertile country, which is extensively irrigated and an excellent breeding-ground for mosquitoes.

A few miles on we passed Kamr Bridge where there is a small fort; this is well known for the fact that some years ago there was frightful treachery practised resulting in the death of the whole garrison. One of the garrison opened the gates during the night to the Wazirs, with whom he was in league, giving the inmates not a chance to defend themselves. It reminds one of what used to be quite common in Scotland, as late as the early eighteenth century.

Tonk was reached at 10.30, it is a small station and quite pretty with beautiful trees and flowers. The country is flat with extensive irrigation and appears to be an important trade centre. After a short visit to the barracks we continued our journey to D.I.K.

Along the road we saw an enormous number of green parrots which looked extremely beautiful amongst the trees. There is a steam tramway line along the roadside from Tonk to D.I.K., all the trains of which seemed to be very well patronized. The road just out from Tonk was under repair for quite a long way and we spent much of our time motoring through fields.

D.I.K. was reached about 1.30 p.m., and we found very comfortable quarters awaiting us in the houses of friends. The afternoon was spent in inspecting the various lines.

The town is well laid out, and at the time of our visit was very pretty

indeed. Unfortunately that evening there was a severe dust-storm, followed by torrential rain, which is quite unusual on that side of the Indus which gets no monsoon.

Next day was fine and we left about 2 p.m. by car for Darya Khan, crossing the Indus bed, a distance of some thirteen miles; during the journey we crossed over no less than four boat bridges, and the going at times was bad. In the hot weather when the Indus is in flood, and all boat bridges have to be removed, this crossing by boat may take the best part of a day, and in the heat this journey is most trying.

The station at Darya Khan is good, with bookstalls and a good refreshment room; this had flourished during the war and has now fallen on rather bad days. We got into a comfortable train and started on the return journey to Pindi. We had a poor dinner at Kundian, an important railway centre, and later changed trains at Daud Khel. That evening we saw a most wonderful thunderstorm with prolonged and very vivid lightning, lighting up the whole of the Waziristan hills. It was most interesting to study the flashes. About 7 a.m. Golra Junction was reached and here the usual half hour was spent, so liberal is the time allowed, Pindi was reached at 8 a.m., and thus a very interesting journey came to an end.



## Current Literature.

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STEVENS, F. A., and DOCHEZ, A. R. **Occurrence of Throat Infections with *Streptococcus scarlatinæ* without a Rash.** *J. Amer. Med. Assoc.*, 1926, v. 86, 1110-12. [9 refs.].

This paper raises points of practical and theoretical interest to epidemiologist and immunologist alike. During an outbreak of scarlet fever occurring among a hospital nursing staff and continuing sporadically for a few months, cases of acute tonsillitis and pharyngitis also appeared. Cultures obtained from these anginal infections yielded in each of five instances an organism identified as *S. scarlatinæ* on the grounds of agglutination and absorption reactions as well as its toxin-producing capacity. Further, these throat infections occurred in Dick-negative reactors. It is, therefore, considered that a scarlatinal angina may occur without a rash and the opportunity is taken to point out that the analogy between diphtheria and scarlet fever is not complete, inasmuch as the Dick test, while indicating antitoxic immunity, is not an index of the amount of antitoxin necessary in the blood to prevent bacterial invasion of the throat tissues. In the outbreak under discussion, there were isolated from throat infections, strains of hæmolytic streptococci which did not give the reaction of *S. scarlatinæ*, nor could an antigenic relationship be established between these various strains.

A. JOE.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 1.*

HOME OFFICE. **Report of the Departmental Committee appointed to consider Evidence as to the Occurrence of Epitheliomatous Ulceration among Mule Spinners.** 29 pp., 4 figs. 1926. London: His Majesty's Stationery Office. [1s.].

[This is a very valuable report; it is one of the finest monographs that have been published upon any form of industrial cancer.]

The Committee<sup>1</sup> have been able to trace 539 cases of epithelioma in mule-spinners attributable to the occupation; the actual number which has occurred is probably considerably larger. Inquiries in France, Germany, Russia, Poland and America have not brought to light any cases in those countries.

The incidence of cancer of the scrotum in different occupations is shown very fully in Table II, from which the following extracts are taken:—

---

<sup>1</sup> Sir GERALD BELLHOUSE (Chairman), Professor A. H. GIBSON, Mr. F. HOLROYD, Mr. E. JUDSON, Sir THOMAS LEGGE (resigned June 11th, 1925), Dr. ARCHIBALD LEITCH and Colonel A. B. SMALLMAN, with Dr. S. A. HENRY, of the Home Office, as Secretary.

Occupation						Mean annual death-rate per million from cancer of scrotum (England and Wales, 1911-1920)
All males	..	..	..	..	..	4.1
Coal miners, below ground	..	..	..	..	..	1.4
Coal miners, above ground	..	..	..	..	..	3.6
Farmers	..	..	..	..	..	1.9
Agricultural labourers	..	..	..	..	..	1.5
Carpenters	..	..	..	..	..	1.9
Fishermen	..	..	..	..	..	16.0
Cotton; carding, winding, warping processes	..	..	..	..	..	27.5
Cotton; workers undefined	..	..	..	..	..	72.3
Cotton; spinning processes	..	..	..	..	..	134.0
Chimney sweeps	..	..	..	..	..	534.3
Patent fuel manufacture	..	..	..	..	..	608.7

It is probable that many of the cotton workers in processes other than spinning had at one time been spinners.

The rapid increase in the disease is shown by the following figures for the Oldham area :—

	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24
Deaths from mule spinners' cancer	.. 3	5	7	9	16	34
Number of spinners	.. .. 5,660	—	—	—	—	8,395

#### *Site of the Growth.*

About 75 per cent. of these cancers occur upon the scrotum, and the remainder upon: (1) Head and neck; (2) upper limb; (3) lower limb; (4) penis; (5) groin and trunk, roughly in that order (descending) of frequency. The data given for the age of onset are of great interest.

"In only 14 (or 2.6 per cent.) of the 539 cases investigated was the duration of employment before the disease manifested itself less than 20 years, while the average duration of employment . . . was approximately 40 years. The shortest length of time in the case of persons employed only as spinners was 10 years, and the longest 63 years . . . the disease may manifest itself some considerable period after employment in a mule-room has ceased. Thus, we have found 13 cases where the disease appeared from 1 to 14 years after the person affected had retired from all employment . . . change of occupation is no guarantee that the disease will not occur."

The cause of this disease has been investigated by experimental methods. A large number of oils were tested on mice by Dr. Leitch at the Cancer Hospital Research Institute. Positive results were given by: (a) All fractions of Scottish shale oil, except lamp-oil; (b) petroleum from Borneo, Assam, Burma (2 samples), Badarpur and Egypt (1 sample); and (c) among refined oils of unknown origin, by a fuel oil and two lubricating oils. Negative results were given by: (a) Petroleum from Russia, Galicia, California, Mexico, Egypt (1 sample) and Persia; and (b) among refined oils, by medicinal liquid paraffin, petrol, a vapourizing oil, and a very light

lubricating oil. The negative are, of course, less conclusive than the positive results, but the former show the possibility of obtaining a non-carcinogenic lubricating oil from mineral sources. "Some animal and vegetable oils have been tested, with negative results, including olive oil, sperm oil, lanolin, sebaceous oil and lard." The carcinogenic character of an oil can be tested only by trial on animals; no chemical test is of any value. The report proceeds to give a very interesting history of the introduction, from about 1862 onwards, of Scottish shale oil and Pennsylvanian petroleum into the industry as lubricating oils. The rapid increase in mule spinners' cancer from 1910 on, shown in a table above, set in about 35 years after the general adoption of these mineral oils in 1875; and this interval is of the length which would be expected from the data, quoted above, on the average duration of employment before cancer develops. Thus the experimental and the industrial evidence agree in indicating that the carcinogenic agent is in the lubricating oil.

In the mule room the temperature is from 70° to 90° F. The men wear only a shirt and a thin pair of cotton or linen trousers. A large part of the lubricating oil applied to the machinery is sprayed off in the next few minutes. "It is from this source that the greatest amount of oil reaches the clothing of the worker, more particularly in the region of the groin." Contact with the "faller bar" seems not to be considered important by the Committee. "It has been supposed that the heat may have the effect of opening the pores of the sebaceous glands of the scrotum, and of facilitating the entrance of droplets of oil into these channels. It is certainly remarkable that so few cases of the disease have been provided by the woollen spinners, who work under more normal conditions."

The remedies discussed are:—

(1) *The provision of innocuous oils.* The oil must be shown to have: (a) No carcinogenic action on animals; (b) the requisite physical properties. These are the subjects for experiments, which are in progress.

(2) *Prevention of oil splash.* Many devices were considered, and are discussed in the report with the aid of diagrams of the machinery. One device in particular is recommended. Further experiments are required.

(3) *Protective clothing* was found, on trial in the mule room, to be impracticable.

(4) *Cleanliness.* A certain amount of contamination with oil is unavoidable whatever measures be adopted; hence washing is of very great importance.

(5) *Periodical medical inspection* is recommended, and the difficulty of voluntary and compulsory systems are discussed. Leaflets should be circulated advising cleanliness and early treatment.

The report concludes with a hearty appreciation of the work of the Secretary of the Committee, Dr. S. A. HENRY.

E. L. KENNAWAY.

Reprinted from "*Bulletin of Hygiene*," Vol. 2, No. 1.

## Reviews.

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**LISTER AS I KNEW HIM.** By J. R. Leeson, M.D., etc. London : Baillière, Tindall and Cox. 1927. 8vo, pp. xii + 212, with 7 illustrations. Price 8s. 6d. net.

At a time when the echoes of the centenary tributes to Lord Lister's memory have scarcely died away, it would seem the merest platitude to refer to his immense gift to humanity. But here is a book that will revive these echoes and be welcomed as a valuable addition to the wide range of Listerian literature. In it we are made to know a beloved surgeon rather than to learn the message which he gave to the world. Every page exhales the incense of hero-worship. The author commenced his medical studies in 1871 in the new St. Thomas's Hospital. He introduces his subject by a graphic description of the surgical habits of the time, when the evils of hospitalism were "regarded in much the same way as a London fog—unwelcome, unconquerable and inevitable." The remedies were quinine and alcohol, pushed to their full extent. In those early days when Lister's antiseptic methods became known in London, attempts to follow them failed. There were too many pitfalls; the meaning of surgical cleanliness was completely misunderstood, and to fail at one point, as the St. Thomas's surgeons appear to have done, was to fail in all.

Murchison, an Edinburgh man, was then lecturing at St. Thomas's and advised Dr. Leeson to go to Edinburgh and follow the practice of Lister. So it came about, and from then onwards Lister was his guide, philosopher and friend, during his medical studies and after. We are presented with vivid pictures of the professor, in whose wards the author was dresser and clerk, in the hospital, in his home, and in his daily going in and coming out, with equally vivid backgrounds; the settings of his operating theatre, his crowded and unusually silent audience of medical students, the entourage of eminent professors and surgeons from every civilized country but his own; the autocratic Mrs. Porter, matron of his wards; but it is Lister's sweetness, kindness, thoughtfulness for the poorest of his patients, tender and winning smile that dominate the canvas on which the author depicts his hero. In one short chapter many of Lister's aphorisms and precepts are brought together. Every one of them conveys a lesson of deep significance to the busy practitioner. Of Lister's life in London, after he left Edinburgh in 1877, there is little recorded in the book. All the world knows how he was ignored at first by his colleagues and attracted only a few students. Then came the great awakening, chiefly under the influence of the continental and American surgeons, who a long time before had adopted the principles of antiseptic surgery. But, although these are the author's views, it should be noted that there were surgeons in London who successfully practised Lister's methods long before he came to London.

Dr. Leeson tells his story modestly and reverently, and incidentally introduces into his pages some delightful glimpses of student life at Edinburgh in the seventies of last century. His book is a scholarly and sympathetic tribute by an old pupil to the memory of a beloved master.

**INFECTIONS OF THE HAND.** By Lionel R. Fifield, F.R.C.S.Eng.  
London: H. K. Lewis & Co., Ltd. 1926. Pp. vi + 192. 67 illustrations. Price 9s.

The author prefaces this book with a minute description of the anatomy of the hand, which is both clear and amply illustrated.

He then deals exhaustively with the various infective processes that may be met with, and how they can best be treated.

The book is most interesting and deserves careful study, by the light of which the various infections of the hand, so frequently met with, will be more readily recognized, classified and correctly treated.

The tendency, both in textbooks and out-patient departments, is to treat these conditions with less consideration than they deserve, and the author, recognizing this fact, makes a praiseworthy effort to emphasize the importance of their correct diagnosis and treatment which is very welcome.

H. C. S.

**THE EARLY DIAGNOSIS OF THE ACUTE ABDOMEN.** Fourth Edition.  
London: Humphrey Milford, Oxford University Press. 1927. Pp. xiv + 237. Price 10s. 6d. net.

This well-known book, now in its fourth edition, is a most useful guide to the diagnosis of those acute abdominal conditions in which delay is disastrous and which call for prompt action in their treatment.

The more common abdominal emergencies, acute appendicitis and perforated gastric or duodenal ulcer, are especially of interest, as they are so often seen in our own hospitals, and in these, as in all emergencies, the recovery rate increases in proportion to the earliness of diagnosis and treatment.

Numerous aids to early diagnosis, including the areas of cutaneous hyperæsthesia in cases of appendicitis and perforated ulcers of the stomach and duodenum, are carefully and comprehensively described.

A study of the figures for gastric and duodenal ulcer in the article by the Consulting Surgeon to the Army, in the February issue of the Journal, shows that 50 per cent of the cases of these diseases treated surgically were actually operated on for perforation, so that it is important for us all to diagnose with certainty such cases when they arise.

There are useful chapters on acute abdominal symptoms in pregnancy and the puerperium and ectopic gestation—also on the acute abdomen in the tropics, all of which are of special interest to officers of the Corps in all countries.

All of the subjects dealt with in the book are of such "life-saving" importance that we should all make up our minds to master them.

N. C.

HELIO THERAPY. By A. Rollier, M.D. Second Edition. Translated by G. de Swietochowski, M.D., M.R.C.S. Humphrey Milford, Oxford University Press. 1927. Pp. xxiv + 318. With 273 illustrations. Price 20s. net.

Few works on therapeutics are of such absorbing and fascinating interest as this well-known volume by Dr. Rollier, of Leysin, the first English edition of which appeared in 1923. A German edition in 1924 was considered to be superior in plan, and the present edition has been prepared to correspond more with it than with the 1923 edition. The preface, however, to the first edition, together with forewords by Sir Henry Gauvain and Dr. Saleeby, written in 1923 and 1922 respectively, are retained.

Dr. Rollier's system of treatment by heliotherapy in the high Alps is now so widely appreciated, and has been studied by so many British members of the medical profession on the spot, that a detailed account of the scientific basis and the methods, procedure and results of his treatment of surgical tuberculosis is scarcely called for in a review of this second edition. The illustrations, all of them photographic, are most convincing as to the value of the treatment, especially in cases of caries of the dorsal vertebræ with kyphosis. No less graphic are the numerous photographs of ulcerative conditions of the limbs and tuberculous arthritis, showing the patient's condition before and after sun treatment in Leysin. The idea was at one time prevalent that sunlight had a therapeutic and bactericidal effect on lesions of the more deep-seated tissues and organisms; but the general improvement in patients, suffering from such lesions, is rightly attributed by Dr. Rollier to the psychic influence of light and to the general stimulus of sunlight and mountain air to throw off and resist disease. The bactericidal action of the ultra-violet rays does not penetrate much below the surface, and Dr. Rollier's dictum that sunlight is unmistakably a psychotherapeutic factor of the first order should be treasured by all who venture to discuss the problems of heliotherapy.

The chapter on statistics is as convincing as the illustrations, and contains a mass of informative tables of the results of heliotherapy, as practised in Leysin, in cases of spondylitis with and without sinus abscesses and other complications, both in adults and children; in cases of pelvic tuberculosis, coxitis, gonitis, tuberculosis of joints, ostitis and periostitis of tubercular origin, and in a variety of other tubercular conditions. During the years 1903 to 1913 the total number of patients treated in the Leysin cliniques for surgical tuberculosis was 652 children and 477 adults. Of these 804 had closed tuberculosis and 325 septic infections; 703 of the former and 242 of the latter were completely healed, 73 and 39 respectively were improved, 22 and 19 remained stationary, and 6 and 25 died. Without going into greater detail, these figures indicate what Dr. Rollier has been able to achieve. But anyone recommending patients to undergo the Leysin treatment should study the one-page chapter on "Contra-indications to Sun Cure." Certain cardiac and renal conditions are absolutely



precluded, as well as lung cases of the nodular type and those in which exudative manifestations predominate.

A chapter on actinotherapy by artificial sources of light and X-rays, contributed by Dr. Amstad, is introduced at the end of the volume. Dr. Amstad's conclusion is that further perfection of the artificial sources of light is most urgently needed, for they appear still to be in a rather primitive state of development; a statement which those who practise heliotherapy in this form should take to heart. With regard to X-ray therapy he states that it is endowed with an almost exclusively local action; and that general treatment has the decisive voice in the fight against tuberculosis.

All who read this volume, or who have visited Leysin, cannot fail to appreciate Dr. Rollier's conclusions with regard to heliotherapy. It does more than cure surgical tuberculosis, for it guarantees the results. "As a true prophylactic against the diseases of children, which so often pave the way for subsequent tuberculous invasion, heliotherapy is one of our best weapons with which we can arm ourselves for this modern warfare." Such is the lesson which we are taught, and a volume that impresses this on the medical profession renders, to use Dr. Rollier's own words, yeoman service.

**MOSQUITO REDUCTION AND MALARIAL PREVENTION.** By J. A. Crawford, M.B., Ch.B.Edin., Captain R.A.M.C., and B. S. Chalam, L.R.C.P. and S.Edin., L.R.F.P. and S.Glas. Pp. x + 99. Oxford University Press. 1926. Price 4s. 6d.

This small book, concerned chiefly with India, has been written to meet the needs of estate managers, malaria inspectors, sanitary squads, and the like, whose special and restricted requirements are ignored in the more ambitious treatises on the subject.

The authors realize, as everyone with experience must, that the success of antimalaria measures, soundly conceived, depends in large measure on the keenness of the personnel in their work, and that intelligent interest cannot be expected in the absence of some exact knowledge of the matter in hand. Too often antimalaria squads may be encountered, equipped with all the paraphernalia of their trade, but so ill-taught that not one of the gang could be trusted even to recognize a mosquito with certainty, and in consequence their trail is soaked with the blood of innocent nematocera crying for vengeance from the ground. Yet when these same men are taken in hand by someone conversant with the subject, and properly instructed, their previously dreary and laborious task undergoes a complete metamorphosis, and is now seen to be replete with interest and opportunity, and the observations of the men themselves may prove most helpful to those whom they serve.

The authors' survey embraces the pertinent facts in the life history and habits of mosquitoes, and the generally applicable preventive measures;

the useful appendices include a synoptic table of the *Anopheles* of India, and hints on the mounting and preserving of mosquitoes.

The book is written in a simple easy style and should prove very helpful to those for whom it is intended. Its circulation may be curtailed to some extent by its price (4s. 6d.), which seems excessive for a volume of some ninety pages.

W. P. MACA.

**MANUAL OF OPERATIVE SURGERY.** By Sir Holburt J. Waring. Sixth Edition. London: Oxford University Press. Pp. lii + 868, 618 figs. Price 18s. net.

The sixth edition of Waring's "Manual of Operative Surgery" is enlarged and brought up to date while still keeping to a convenient size.

It is essentially a practical volume, and describes the technique of all useful operations in simple and concise language.

There is a glossary for transcribing the old and new terminology in anatomy which will prove useful to those who are not recently qualified.

Special chapters are devoted to operations on the eye, ear, nose and throat.

The operations on bones, including amputations and excisions of joints, are very fully described.

A short account is devoted to blood transfusion.

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## Notices.

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## Original Communications.

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### TENTH CAVALRY BRIGADE COMBINED FIELD AMBULANCE OPERATIONS IN PALESTINE, SEPTEMBER, OCTOBER AND NOVEMBER, 1918.

BY LIEUTENANT-COLONEL H. F. HUMPHREYS, M.C.  
*Royal Army Medical Corps (T.A.)*

#### INTRODUCTION.

THE unit whose work is described in the following narrative was attached to the 10th Cavalry Brigade, one of those which formed the 4th Cavalry Division. This division, together with the 5th Cavalry, Anzac and Australian (Ausdiv) Mounted Divisions made up the Desert Mounted Corps, whose operations during the campaign are recorded in the published dispatches.

The unit was formed in May, 1918, when Indian cavalry replaced the yeomanry regiments sent to France, and its establishment, published then in provisional form, was constantly being modified right up to the last. It was complicated, as Indian medical establishments are, by the mixture of military personnel and followers, and by the specialization of duties due to the caste system. As it never received a final form, and as it was reorganized, as described in Section I, on the eve of operations, it is not proposed to do more here than give a general idea of its resources, comparing it with the Cavalry Field Ambulance whose establishment is familiar from Field Service Manual, Army Medical Service, and omitting all description of its establishment in detail.



It consisted of three sections (one British, two Indian) and the transport section.

(a) The British section consisted of 3 R.A.M.C. officers, 2 assistant surgeons, a pack-store sergeant, a clerk, 5 British nursing orderlies and 4 signallers. The remaining personnel were Indian and included 16 bearers, 5 ward servants, 2 cooks, 2 sweepers, a washerman and water-carrier. Its equipment was practically the same as that of a section of a cavalry field ambulance. Ten R.A.M.C. privates were temporarily added to this establishment a few weeks before the campaign opened.

(b) The two Indian sections each contained one I.M.S. officer, the remainder of the personnel being Indian and consisting in the case of each section of two sub-assistant surgeons, hospital store-keeper, pack store havildar, sixteen bearers and an allotment of ward orderlies (nursing personnel), cooks, bhistis, dhobies and sweepers. A section's equipment resembled that of the British section in all important particulars, with differences in the cooking utensils, etc.

(c) The transport section contained no Indians, the drivers being approximately half British and half Egyptian, while the N.C.O.'s and artificers were British and were much the same as those of a cavalry field ambulance. British drivers also acted as grooms to the officers, assistant and sub-assistant surgeons. The transport consisted of 6 light ambulance wagons, 4 Ford motor ambulance cars, 5 limbered general service wagons, 5 general service wagons, 2 water carts and 3 pack mules. Each of the horsed vehicles was drawn by 4 mules, the total of draught animals (including 4 spares) being thus 76. Two days before operations began twenty camels with cacolets were temporarily added to this establishment, enabling forty additional patients to be carried. The establishment of riding animals was 39 riding horses and 16 donkeys, though the numbers actually available were 41 horses and 24 donkeys. The distribution of these to the personnel on the War Establishment need not be described as it was not adhered to in practice.

It should be added that the general shortage of assistant and sub-assistant surgeons caused them to be replaced in practice by R.A.M.C. serjeants, with the exception of one sub-assistant surgeon who was the only Indian officer with the unit. None of these serjeants had any previous experience of service with Indian troops. Similarly one I.M.S. officer was replaced by an R.A.M.C. officer.

It will thus be perceived that the organization of the unit was very different from that of a cavalry field ambulance with its two equal sections, each further split up into bearer and tent subdivisions; and reorganization on similar lines to these had to be undertaken on the eve of operations.

This narrative was written in 1918 and the references to War Establishments as laid down in Field Service Manuals are to the pre-war editions. Recent changes in numbers and nomenclature are not taken into account.

## SECTION I.

## PRELIMINARY ORGANIZATION AND THE MARCH INTO POSITION.

It was not till early September that the first hint of a forthcoming campaign was dropped in the shape of instructions to organize the combined field ambulance into mobile and immobile sections. Owing to the distribution of the unit between Ain Hujla and the main dressing station on the Jericho-Jerusalem road, this could only be done on paper and no sectional training was possible. The paper organization was devised on the same general lines as for the Jerusalem campaign, but the specialization of duties in an Indian unit attendant upon the caste system introduced complications which were not present with wholly British personnel. The establishment had been temporarily increased by ten R.A.M.C. privates who joined on August 29 and the next day a draft of thirty-one Indians arrived, bringing the unit up to strength.

As the War Establishment of a combined cavalry field ambulance only contemplates subdivision into three sections, one British and two Indian, all of which contain a number of dismounted men, it has been thought advisable to describe in some detail the reorganization into mobile and immobile sections, as the success of medical arrangements in the subsequent campaign largely depended on a wise choice of men, mounts, transport and equipment in this preliminary organization.<sup>1</sup> It was drawn up on the following lines:—

(1) *Mobile Section.*

A. *Personnel and Horses.*—(1) Three R.A.M.C. officers (Lieutenant-Colonel H. F. Humphreys, O.C., Captain W. E. H. Bull and Captain M. Morris), 1 Indian officer (an S.A.S.), 10 R.A.M.C. N.C.O.'s and privates (including 4 signallers), the transport N.C.O.'s and officers' grooms were all mounted on horses: of which 37 out of a total of 41 were apportioned to this section. The remainder of the horses were allotted to Indians, and 2 N.C.O.'s, 3 men leading pack mules and 3 complete stretcher squads of 4 men each were mounted in this way.

(2) Twenty-four donkeys were used to mount Indian followers. All the special duty men, such as cooks, bhitis, ward servants and sweepers, together with twelve A.B.C. followers (who acted as bearers at the dressing station), donkey syces and officers' servants were thus carried.

(3) Ten more personnel, made up of artificers, ward orderlies and wagon orderlies were carried on the limbers and light ambulances. It need scarcely be added that no men marched on foot with the mobile section.

(4) The remainder of the personnel were drivers, those of the horse transport being roughly fifty per cent British and fifty per cent Egyptians, while 19 C.T.C. drivers accompanied the camels. The total strength

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<sup>1</sup> All details of this reorganization were left to C.O.'s and were probably different in the other cavalry field ambulances of the Corps.

of the mobile section was thus 3 British officers, 1 Indian officer, 35 British O.R.'s (one half of whom were drivers), 50 Indian N.C.O.'s and men, 31 Egyptians.

**B. Transport.**—(1) All the six light ambulance wagons were of course allotted to this section, but as one had to be sent into workshop for repairs early in this month the unit marched out on operations with only five.

(2) The four motor ambulances were increased to six, but these were detached to form a divisional motor ambulance convoy.

(3) Twenty camels, fifteen lying and five sitting cacolets, were drawn at Ramleh on September 17, but five lying cacolets had to be handed over on September 20 to the 12th Brigade Cavalry Field Ambulance who had not drawn them, so that the carrying capacity of the camels was reduced to thirty patients.

(4) All five limbered wagons were taken with the mobile section as it was not thought that general service wagons would be able to keep up with the brigade on forced marches. These wagons carried an average of 1,000 pounds of stores apiece, and in addition one water cart was taken. Only four mules per wagon were available for these as well as for the light ambulances, but the loss of one of the latter (see above) enabled an extra pair to be harnessed to the water cart and the "medical comforts" limber whose load somewhat exceeded that of the others.

(5) Three pack mules carried water in fanatis and sufficient stores lightly to equip an advanced dressing station.

**C. Equipment.**—In the selection of equipment the exigencies of transport necessitated the dumping of a certain amount of the authorized equipment to make room for other more important stores. Speaking broadly, the equipment of the British section was taken, plus sundry items (e.g., cooking utensils), from that of one Indian section to enable Indian requirements to be met. The medical equipment of one Indian section was dumped; in addition the forge, the bulk of the wheelers', farriers' and saddlers' tools, half the general service panniers with their contents, and No. 2 medical and surgical panniers were all left behind, though some of the more valuable items from these stores were taken in other panniers or bags. Previous experience of supply difficulties during a cavalry advance caused the inclusion in the loads of large quantities of medical comforts such as champagne, milk, cocoa, etc., a numerous assortment of splints, sacks of extra bandages and dressings, extra drugs such as quinine and sera, Red Cross bed rests for chest and abdominal cases (a most valuable item) and extra stretchers, blankets and ground sheets. Transport requirements included an extra number of spare poles and perches and a good supply of horse shoes—an addition which, though heavy, was fully justified in practice as no more were supplied for two months and the unit went through the campaign without a single case of lameness amongst its animals. These extra stores were indented for at once, though the bulk of them were not drawn till arrival at Ramleh.

*D. Subdivision into Bearer and Tent Divisions.*—This was established as follows: Two officers and about half the personnel (British, Indian and Egyptians) went to the bearer division, mounted on four-fifths of the horses and one-fifth of the donkeys. One officer and the remainder of the personnel formed the tent division, mounted on one-fifth of the horses and four-fifths of the donkeys, the personnel being allocated to one or the other according to the nature of their duties, bearers, nursing orderlies, ward orderlies, etc. All transport for casualties was included in the bearer division, while the water-cart and limbered wagons, together with the bulk of the stores, went with the tent division. One limbered wagon, however, and the three pack mules were allotted to the former and these carried sufficient equipment and water to enable an advanced dressing station to be formed.

(2) *Immobile Section.*

*A. Personnel.*—This consisted originally of 1 R.A.M.C. officer (Captain J. R. K. Thomson), 1 I.M.S. officer, 10 R.A.M.C. N.C.O.'s and men, 19 A.S.C., H.T. (including an N.C.O., a shoeing smith, 3 grooms and drivers), and 43 Indian N.C.O.'s and men. The last category included special duties, such as ward orderlies, ward servants, cooks, bhistis, sweepers and dhobies, plus the bulk of the bearers who could not be mounted in the mobile section. Four riding horses only travelled with this section (for the officers and R.A.M.C. serjeants) the remainder of the British personnel being carried on the general service wagons and the Indians marching.

*B. Transport.*—All the general service wagons went with the immobile section, but as the unit began operations short of establishment in animals, only four mules per wagon were available, and the section possessed no spares. One water cart was also taken.

*C. Equipment.*—In general the complete equipment of one Indian section was taken plus a few items from that of the British section (cooking utensils, farriers' tools, etc.), the tents, blankets, stretchers, and ground sheets of the second Indian section, and extra stores as for the mobile section.

THE MARCH TO POSITION.

On the night of September 11, the field ambulance left the Jordan Valley in rear of its brigade on the march to the left flank. The distance was covered by five night marches, the brigade resting during the day. These marches were probably of benefit to the animals and made them harder and fitter for the ordeal before them, but the lack of sleep (heat and the flies made it almost impossible to sleep by day) tried the men severely. The dismounted men of the unit had gone direct to Ramleh from the Jordan Valley by motor lorry and rail, and they rejoined the rest of the unit on its arrival at Ramleh on the 17th. The two days spent here were times of great activity and considerable strain. Remounts of horses and donkeys had to be drawn, all camels and cacolets sent for, numerous stores

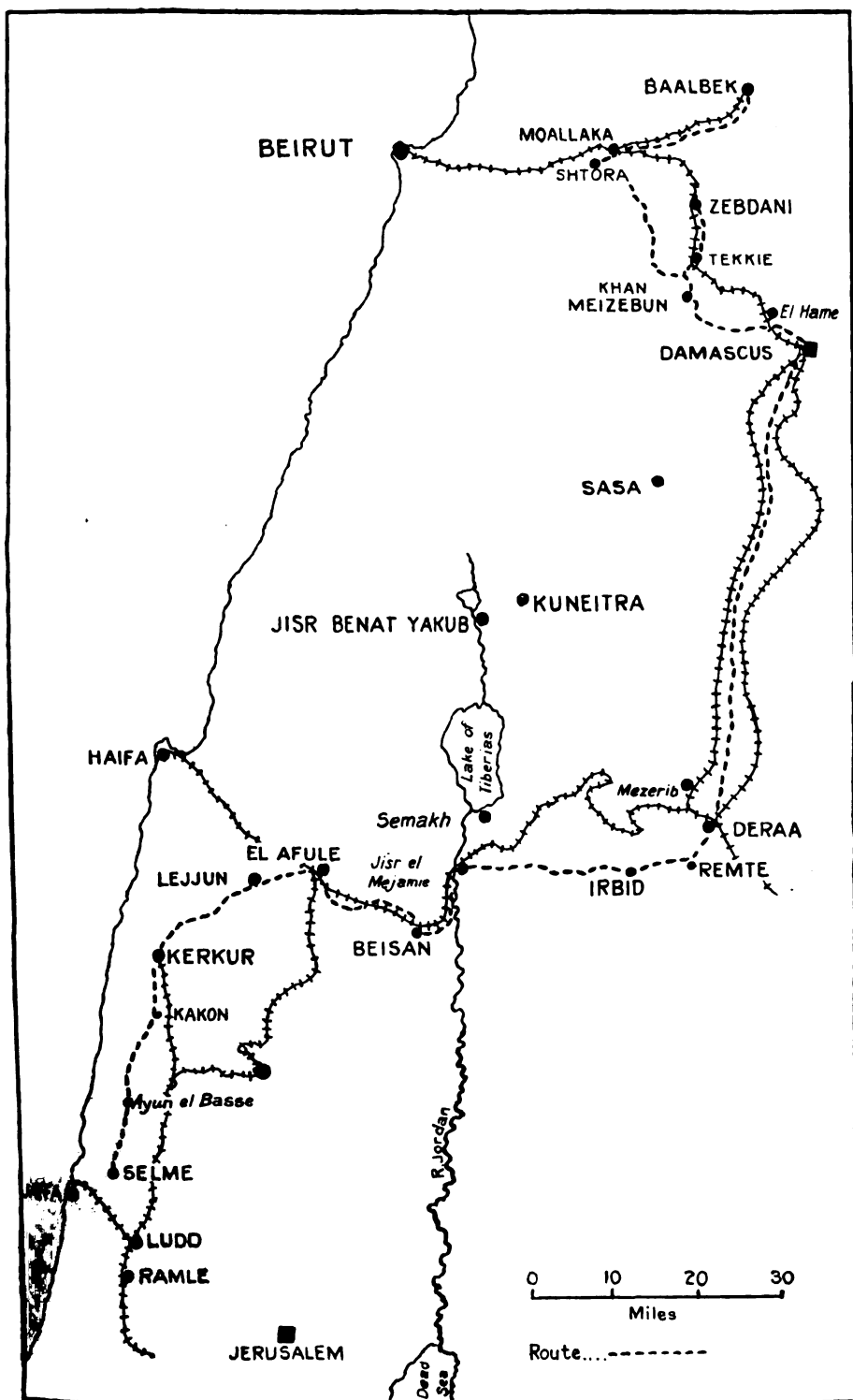
drawn from ordnance, medical stores, Red Cross, etc., and the many items of equipment which it had been decided to leave behind sorted out and sent to Ludd. Finally the division into mobile and immobile sections previously planned was carried out and the latter placed under the direct orders of the A.D.M.S. Eleventh hour casualties entailed some changes here as the I.M.S. officer went sick and the Indian S.A.S. was transferred from the mobile to the immobile section to take his place. This left the mobile section without a single I.M.S. officer, S.A.S., or assistant surgeon, and as only a slight knowledge of Hindustani was possessed by officers and N.C.O.'s, the difficulty of handling the Indian personnel and patients was serious and remained a grave handicap on the section throughout the campaign. The chronicle of the immobile section—which operated separately under the direct orders of the A.D.M.S.—will be reserved for a later chapter; this narrative will henceforth concern itself with the movement of the mobile section, which alone performed the duties of a front line unit and will be called the field ambulance. On the morning of the 17th the scope and intentions of the forthcoming operations were explained to O.C.'s field ambulances by the A.D.M.S., and the same evening the brigade moved to Selme by a night march, bivouacking in orange groves under camouflage all the next day. Late in the afternoon operation orders were received. Thus it was literally only a few hours before the unit marched out on operations that the nature of the operations and the distance it was proposed to cover were explained: too late to effect any of the reductions of wagon loads and of equipment, which would have been adopted with adequate notice. Indeed the extreme secrecy observed, the absence of any period of preparation, and the necessity for a long march across the entire Palestine front on the eve of operations probably told more heavily against the field ambulance than any other units of the brigade. For the field ambulance alone took the bulk of its transport into the field with the brigade, and the need of a complete reorganization of the unit in a few days, with only the most general notion of the task in front, imposed a severe strain and considerable anxiety on all those concerned.

## SECTION II.

### THE MARCH TO BEISAN.

At 06.00 hours on September 19 the ambulance started.

After a two hours' march it arrived at the Nahr Auja and watered there, reaching after another hour the position of readiness. Here a halt of one hour was made in which the animals were off-saddled and fed while the men had breakfast. At 09.30 hours the brigade moved off again; the going which previously had been very fair now became heavy, and the field ambulance fell behind the brigade, but caught it up at Ayun el Basse, where it halted for twenty minutes after two hours of continuous marching. Following this the going became worse than ever—sandy and broken—and



the brigade began to trot at intervals : the draught animals soon began to show signs of distress, so it was decided to proceed at an independent pace, keeping in touch with the brigade by means of connecting files, Captain Bull and four men, spaced out at about half mile intervals, being told off for this duty. After the ambulance had struggled for another one and a half hours through sandy soil, a halt of twenty minutes was called and the animals given a small feed. On starting off again at 14.15 hours the going improved, and the mules, refreshed by the feed, settled down to their work. From this point the camels were left behind with orders to proceed at their own pace, the direction of the march and the ultimate objective having previously been carefully explained to the private in charge. The ambulance was still in touch with its rear connecting file, and four hours of steady marching brought it to Tell-ed-Dhur, with the brigade a little over a mile away. But as dusk was falling fast, and the brigade was on the move, it was decided not to try and find the brigade in the dark but to march direct to Kerkur and join it there. This was done, and Kerkur reached at 20.00 hours. Here good watering was found at a well, the animals were off-saddled and fed, tea was made, and animals and men alike had a good rest of two hours, after which the ambulance proceeded to Sumrah and marched off from there in rear of the brigade. No casualties had yet occurred and the mules had got their second wind and were well into the collar. On leaving Sumrah at 23.00 hours the brigade lost two hours by a mistake in direction and did not finally enter the Lejjun Pass till 01.00 hours on the morning of the 20th. From this point on, the narrative of the field ambulance is identical with that of the bulk of the brigade, as on the road no difficulty was experienced in keeping up with the regiments. An all night march was followed by a rest of two and a half hours at Lejjun, but the watering here had been cut up by the troops in front and few animals drank. El Afule was reached at noon, and at 13.30 hours the brigade led the division on the march to Beisan. On the advice of the A.D.M.S. all wheels and the donkeys made this march at a walk with the transport of Divisional Headquarters, only men mounted on horses and the pack animals proceeding with the brigade, the intention being in the case of an action at Beisan to form an advanced dressing station with these until the wheels came up. Most of the sixteen miles to Beisan were covered at the trot, and the advanced detachment rode in on the heels of the brigade at 17.00 hours ; but as no action took place no dressing station was formed, and the detachment went into bivouac, the rest of the ambulance arriving after being hung up by other transport at 20.00 hours.

Thus a straight march of eighty-five miles, increased to over ninety miles by the circular tour at Sumrah, was covered by the field ambulance in thirty-eight hours, and by the advanced detachment in thirty-five. It has been described in some detail chiefly because it is easily a record for field ambulances, again because the field ambulance (and R.H.A.) alone amongst the units of the brigade took all its transport on the march and

had teams of only four animals to the wagons. Its salient features and the lessons to be learned from it may be summarized under the following heads :—

*The Striking Absence of Casualties.*—Only one or two cases of sickness or minor injuries were picked up on the journey and carried forward to Beisan. Had heavier casualties occurred it had been intended to carry them forward till our carrying capacity was fully taxed, and if it were exceeded to leave dumps of patients, with small detachments of personnel in charge, at convenient places on the road close to water, such as Sumrah, Lejjun or Afule, where they would have been collected by the Divisional Motor Ambulance Convoy. That this was not necessary made the medical arrangements relatively simple.

*B. The Capacity of the Animals to stand the March.*—That the camels would drop behind was a foregone conclusion, and had been provided for by giving the R.A.M.C. private in charge, an exceptionally intelligent and resourceful soldier, the fullest possible information of the march in front of him. He eventually arrived at Beisan on the morning of the 22nd. More surprising was the power of endurance shown by the mules. With only four mules to a limber and carrying two and a half tons of stores, the field ambulance proved itself capable of covering any distance that cavalry might be called upon to march. Not a single animal foundered or failed to do its bit, and the only casualties were half a dozen neck galls in the wheelers (a form of casualty particularly liable to occur with limbered wagons) and about seven sore backs among the riding horses; these were attributed to the long trot from Afule to Beisan, coming as it did after a seventy-five mile march, with the men tired and not riding their best. The rapid recovery of the mules on the afternoon of the 19th was striking. But perhaps the most remarkable performance was that of the donkeys. Not one of the twenty-four ever fell behind or showed signs of distress and they sustained not a single casualty of any kind. That they should have demonstrated their capacity to carry a man ninety miles in thirty-eight hours over mixed going appears to be a military discovery of some importance.

*C. Keeping in touch with the Brigade.*—On the good going subsequent to Sumrah, the ambulance easily kept in direct touch with the rear of the column, but the pace on the first day raised special difficulties for a unit that consisted mainly of transport. The chief lessons to be learnt were :—

(a) The value of well-posted connecting files. The plain of Sharon is undulating, featureless and blind, and the connecting files halted on the summit of each swell and signalled with flags till the last one was answered by a signaller with the ambulance, when they crossed the valley to the next ridge and so on. This worked well till darkness fell, when of course connecting files so widely spaced ceased to be of service. (b) The need for sending messages back from the brigade. The operation orders contemplated the



brigade watering at Kakon, but apparently these were changed on the march, though no notice came back to the ambulance. Fortunately no harm resulted as the connecting files maintained contact, and when this was lost after dark the decision to proceed to Kerkur resulted happily. But if the field ambulance had been reduced to marching by map and compass it would have gone to Kakon and lost touch with its brigade, probably for the rest of the march.

The five days spent at Beisan call for little comment. Until the arrival of the immobile section the ambulance was opened as a divisional collecting station, and all casualties of the division passed through it up to September 24, when the immobile section, which had arrived the night before, took over. Light ambulance wagons collected casualties from the regiments, most of them occurring within easy reach, and the evacuation to Sumrah arranged by the A.D.M.S. worked smoothly, the bad cases travelling in motor ambulances and the lighter cases in motor lorry; 141 cases in all were passed through the ambulance during the five days at Beisan.

The few days' rest here enabled the animals to recover and the galls incurred on the march to heal; a captured Turkish travelling cooker was taken on with a team of three mules and proved of the very greatest value on subsequent operations. The strength of the bearer section was increased by another mounted squad of four men and a pack mule, the men being found from the surplus bearers of the immobile section on its arrival and mounted on captured ponies.

Mosquitoes were breeding freely at Beisan and the troops had no protection against their attacks. The field ambulance bivouac was kept as far away from water as possible, and to this is attributed the fact that in the subsequent epidemic of malaria it suffered less severely than the regiments.

### SECTION III.

#### THE MARCH TO DAMASCUS.

##### UP TO IRBID.

September 25 : At 16.00 hours on the afternoon of September 25, the ambulance marched in rear of the Brigade to Jisr el Mejamie, and after a night in bivouac there started for Irbid. The march was uneventful till midday on September 26, when the dilapidated state of the bridge over the stream at Arab el Ramel hung up the ambulance for two hours while repairs were in progress; touch with the Brigade was thus lost and the ambulance marched by map and compass to Irbid. At the Wadi el Gharr it was met by orders from the staff captain to halt under cover and send forward an advanced dressing station. No particulars of casualties were given, so while the main body bivouacked for the night, Captain Bull, a detachment of bearers, and two light ambulances with some equipment were sent forward. The camels had fallen behind on the march, and being

overtaken by darkness a few miles short of the Wadi el Gharr had bivouacked for the night and did not join up till next morning.

The advanced dressing station on joining the brigade (about 21.00 hours) found nearly thirty casualties which had been collected by the regimental stretcher bearers and the personnel was up most of the night dressing these. The O.C. rode forward at dawn and hearing that Irbid had been (September 27) evacuated by the enemy, ordered the rest of the ambulance up and the casualties were all redressed and fed. Ambulance wagons were sent forward to collect other casualties reported to be lying out at Irbid, but no attempt was made to pitch canvas or open up the main dressing station as the brigade was moving on, and it was urgent to evacuate cases and move forward as soon as possible.

Three men died at the A.D.S. and were buried there, leaving thirty-four cases for evacuation. Most of these were lightly wounded or merely injured by falls from their horses during the charge, but four severe cases were sent in one light ambulance, and the remainder were loaded on to the fifteen cacolets. It was decided to send this convoy back as far as the wadi crossing at Arab el Ramel, and a wireless message was sent to the A.D.M.S., asking him to send motor ambulances forward to that point to meet them. This was done and the convoy having transferred its cases started back to catch the brigade the same evening (September 27). The motor convoy took the cases to Jisr el Mejamie where the divisional collecting station was now installed.

#### AT REMTE.

In the meantime the ambulance moved forward to Er Remte, where the brigade was in action, as soon as the casualties at Irbid were cleared. The late arrival of the camels had delayed the start till 11.00 hours, but good marching brought the unit to Remte by 14.30 hours. The action was over and most of the cases already collected by the regimental stretcher bearers. The field ambulance bearers collected the rest and the tent section was opened up, tents being pitched and the cases cleaned up, dressed and fed as soon as they came in. A dressing station for wounded prisoners was established in a house close by under the charge of a Turkish M.O.

#### REMTE TO DAMASCUS, SEPTEMBER 28.

The brigade moved forward to Deraa at dawn, and this made it necessary to divide the ambulance into two, the bearer section accompanying the brigade, while the tent section had to remain at Remte till it was evacuated. It will thus be convenient to describe the history of the next few days, until the two sections joined up at Damascus, under the three headings, the bearer section, the tent section, and the camel convoy, which was used to evacuate the latter.

(1) The bearer section arrived at Deraa in the morning with its brigade.

One light ambulance wagon had sustained a broken perch just before reaching Remte and had to be abandoned there, but the one used to evacuate from Irbid joined up to-day (a very fine performance considering the distance covered) so that the sole transport for casualties now available to the bearer section was four light ambulances. Orders were received from the A.D.M.S. that no more evacuation to the rear was possible, and that all casualties admitted from this point were to be taken forward to Damascus. In view of our exiguous carrying capacity this decision caused no small anxiety, but the situation was explained to regimental medical officers and it was decided that the use of light ambulances should be restricted to wounded and severely sick men, and that men unfit to ride with their regiments but able to sit a horse, e.g., fever cases, should ride with the field ambulance. If more cases than we could carry came for admission it was intended to distribute them amongst the transport wagons of "A" echelon, or a company of the divisional train which was now travelling with the brigade.

Two days' supplies were drawn at Deraa on the 28th, and on the morning of the 29th the bearer section followed its brigade on the march to Damascus. The march, tiring as it was, calls for little comment as the bearer section remained with its brigade throughout, and after three marches reached Damascus on the morning of October 1. The 140 miles from Beisan had been covered in six days, or in three long marches and four short ones. Fortunately the number of sick sent to the field ambulance was small, and the plan of taking the lighter cases on their own horses kept it well within our carrying capacity. The late arrivals in bivouacs and the early starts precluded any pitching of tents, and the sick spent the night in the ambulance wagons. An attempt was made to deal with some of the Turkish sick stragglers encountered, by carrying them forward to the nearest water and leaving them there. Two wounded prisoners picked up (one of them German) both died on the march.

(2) *The tent section*, under Captain Morris, remained at Remte, all the 28th receiving sick from the 11th and 12th Brigades and Divisional troops as they passed through, so that by the evening of that day there were fifty-four patients in the dressing station, about twenty of whom were wounded. Three days' rations were drawn from the divisional train as it passed through, and the next morning the divisional motor ambulance convoy arrived and took away twenty-four cases. The cacolet camels returning from Arab el Rahel arrived the same day, and early next morning (September 30) the remaining thirty patients were loaded into these, and the tent section struck camp and started for Damascus via Mezerib. The distance was covered uneventfully in two and a half days, and the section rejoined the brigade at Damascus on the morning of October 2. From September 28 till October 2, when it arrived at Damascus, the section had no guard or escort and no information about watering places on the road, and it speaks well for the cool and skilful handling of the section by

Captain Morris, both at Remte and on the march through uncivilized country infested with armed Arabs and Turkish stragglers, that it rejoined the brigade with so much expedition.

(3) The camel convoy left Remte on the morning of September 29 for Irbid; it passed through that place, but six miles west of it met the divisional motor ambulance convoy and transferred its patients, returning to Irbid to water and bivouac for the night. The next day it left for Remte, picked up some sick Turkish prisoners there and conveyed them to Deraa station, and on the following day (October 2) left for Damascus, rejoining the ambulance there on October 4. Private R. A. Gibbs, R.A.M.C., was the only British rank with the convoy, which otherwise consisted of C.T.C. Egyptians. The party was totally unarmed, and Private Gibbs had neither map nor compass (Beirut maps were only received on September 28). That he should have pushed on and successfully conducted his party to Damascus through country made dangerous by marauding Arabs, showed the greatest possible courage and resource. Including the journeys to and fro, his convoy travelled unescorted over 150 miles, and for days on end saw no British troops. On one occasion he took a Turkish rifle and beat off a raiding party of Arabs and, finding supplies running short he picked up on the road Turkish equipment, such as boots, and bartered them in Hauran villages for tiffin, milk and eggs. He was awarded the Military Medal for his service.

#### LESSONS OF THE MARCH.

This completes the narrative of the ambulance as far as Damascus and it only remains to point the moral and adorn the tale with a brief consideration of the lessons to be learnt from it. These were :—

A. *Early Information of Casualties*.—The importance of this was shown at Irbid, where a less lightly equipped dressing station would have been sent forward had it been known that so many, or even that any, casualties, had occurred. It is well to send back a rough estimate of casualties even if it means waiting a short time.

B. *Collection of Casualties*.—The small number of mounted bearers with a field ambulance, the fact that most of these were required at the advanced dressing station as loading parties, etc., and the wide scattering of cavalry casualties places the main work of collecting wounded on to the regimental stretcher bearers first of all, and after that on to light ambulance wagons which bring them to the dressing station. The latter wagons are therefore used for collection rather than evacuation of casualties, and their faulty design and the absence of spare parts was illustrated by the total loss of one of them at Remte from such a common accident as a broken perch.

C. *Difficulties of Evacuation*.—The division on this march was in reality a flying column, and there was no supply transport returning empty which might ease the problem of evacuation. Consequently, the ambulance was

thrown entirely on its own resources, and the course of events taken was a typical example of the difficulties besetting a field ambulance serving a cavalry advance on which successive daily actions are fought. The evacuation by slow moving camels threw them a day's march behind after Irbid, and finally immobilized the tent section for two days after Remte, showing clearly that the form of ambulance transport most suitable for cavalry is one that can evacuate quickly and catch them up, in other words, motors. When there is no supply transport to assist in the evacuation of lighter cases, these are required in much greater numbers than when lines of communication are developed.

D. The necessity of sending back single wagons on long journeys, as from Irbid, or R.A.M.C. privates in charge of convoys, as with the camels, shows how much responsibility may devolve on the private soldier when working with a field ambulance, and the vital importance of using Class A British personnel for this work. The small number of N.C.O.'s renders them indispensable for work at the dressing station, where they all have special duties, and small convoys have to be conducted by privates.

#### SECTION IV.

##### DAMASCUS TO BAALBEK AND THE EPIDEMIC.

The brigade was bivouacked in orchards outside Damascus from October 1 to 6, but during these days the tent section remained closed under orders of the A.D.M.S., and all casualties admitted were evacuated at once to the 11th or 12th Brigade Field Ambulances. The epidemic of fever that finally reduced the division to impotence began suddenly and with great violence at this time, over 200 cases of sickness from the brigade being passed through in the last three days at Damascus. The immediate evacuation precluded any prolonged observation of cases, and there were no facilities for microscopic diagnosis, but malaria was expected to break out now, a fortnight after the free infection at Beisan, so all cases of fever were given quinine. On October 6 the brigade left Damascus on its march north, and reached Baalbek on October 15, remaining there till the armistice with Turkey was declared. These ten days are not likely to be forgotten by anyone in the ambulance, and were a period of continuous and almost intolerable strain. As the ambulance kept with its brigade throughout, the details of the march call for no comment, and the salient points of the medical arrangements are all that need be considered. There were six days of marching and four days of rest (?) between Damascus and Baalbek, and as they all possessed a close similarity it seems best to describe them categorically rather than in sequence. They all possessed the same feature in the overwhelming numbers of sick admitted, evacuations from the ambulance during the month totalling 1,307, and on several occasions on this march rising to over 100 in a single day. The march diary was as follows :—

October 6, Damascus to El Rame.

„ 7, El Rame to Khan Meizebun.

„ 8, Khan Meizebun to Zebdani.

„ 12, Zebdani to Tekkie.

„ 13, Tekkie to Sthora.

„ 15, Sthora to Baalbek.

A. *The Collection of Casualties*.—Many men were struck down with fever on the march and were picked up by the ambulance wagons travelling in the rear of the brigade. In bivouac the units were all close at hand and most of the cases walked in; those that could not walk were collected by the cacolet camels.

B. *The Reception of Casualties*.—Every night all canvas available was pitched for the reception of cases, the overflow being accommodated in light ambulance wagons. A space between two of the latter was roofed with a wagon cover and served as a dispensary. This work had to be done immediately on arrival in camp, while the animals were being off-saddled, watered and fed and the lines laid out, and the small number of men available for such duties in a mounted unit was a severe handicap. Twelve men were evacuated sick in the first ten days of the month, and half a dozen others remaining with the unit were more or less incapacitated by fever; so that when one man per three horses and one per six donkeys had been told off for off-saddling, stables, etc., and special men such as cooks and sweepers released for their duties, a working party of less than twenty men all told was available for immediate use on tent pitching, loading parties, etc. (The advantages possessed by donkeys over horses may be remarked in parenthesis: requiring less attention they enable five men out of six to be released for general duty on arrival in camp, instead of two out of three.) The bulk of this party were Indians and their lack of training, entailing as it did minute supervision and the difficulty experienced by the British N.C.O.'s in communicating with them, threw a great strain on the latter.

Accurate clerking and filling up of the medical cards was a very important feature of the reception of patients, and here again the fact that none of the Indian personnel could read or write English, and none of the British personnel speak Hindustani hampered the work. The clerk, too, was down with fever most of the march, though he never failed to enter every case admitted.

At Zebdani, where evacuation was stopped by the A.D.M.S. for two days, the number of patients received soon overflowed the tents, and accommodation was increased by erecting a large shelter made of the bivouac sheets brought in by patients and a framework of saplings put up in a few hours by the R.E.

C. *The Nature of the Sickness and its Treatment*.—Over ninety per cent of the cases admitted were fever, and the few days at Zebdani afforded opportunities for observation of its course, reaction to quinine, etc. These confirmed the opinion that the overwhelming proportion of it, say nine

cases out of ten, were malaria, and this view was corroborated later when the history of relapsing cases and the facilities for microscopic diagnosis shed more light on the epidemic. The view of some that the majority of cases were influenza was certainly not true of this brigade.

D. *Evacuation.*—This was the chief problem before us, failing in which we failed in all. Had evacuation broken down on any single day when the brigade was moving the tent section would inevitably have been immobilized, as a consequence of which it would have been beset with all the supply difficulties that arise when a unit becomes separated from its brigade.<sup>1</sup> Evacuation up to October 12 was back to Damascus, and after that forward to Beirut. The great distance rendered evacuation by other than motor transport out of the question, and the motor transport available was motor lorries and motor ambulances.

The divisional motor ambulance convoy was broken up at Damascus and four cars rejoined the ambulance. These were used only for the evacuation of serious cases and the bulk of the patients were cleared by motor lorries. The difficulties attendant upon the use of these may now be described. The motor-lorry convoy is a capricious creature on Syrian roads and no one in the division was able to give more than an approximate forecast of its probable movements. Lorries would arrive suddenly, dump their loads and be off again by the time information of their advent had filtered through official channels. On the other hand if a convoy of patients was sent to the divisional refilling point to wait there they might be lying about for hours, without shelter, food or treatment, owing to the late arrival of the lorries. Moreover, it was of great importance to the supply service that lorries should not be kept waiting. These difficulties were met by the following means :—

(a) *Obtaining early information of their arrival* by keeping a couple of gallopers at the divisional refilling point. At El Rame and Khan Meizebun, where this was some distance away, we were able to keep patients under shelter and proper treatment till the last moment, and yet be in time to catch the lorries by the prompt information these gallopers supplied.

(b) *Siting the Field Ambulance near the Divisional Refilling Point.*—This is far the best plan when a large number of cases have to be cleared. At Sthora and Baalbek it was found a simple matter to evacuate over 100 cases in the day as lorries were loaded up with patients as soon as they had dumped their stores. On the other hand, at Zebdani, where the point was six miles away, great difficulty was experienced. The stoppage of evacuation for two days had allowed patients to accumulate when the division was suddenly ordered to move, and over 200 patients had to be carried back to the point at Tekkie on the camels, light ambulances and four motor

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<sup>1</sup> This fate befell the two other field ambulances of the division.

ambulances in a little more than twenty-four hours, in time to catch the lorry convoys. Only prompt action and devoted work on the part of all ranks saved us from being immobilized at Zebdani, a fate which overtook the other field ambulance there.

The disadvantages of evacuation by motor-lorry convoy need not be dwelt on. It is impossible to send back orderlies, medical equipment, or stretchers with the patients, as there is no probability of their return. All that could be done when the journey was long, as to Beirut, was to hand over supplies of medical comforts to the lorry drivers so that the patients could receive some food on the way.

E. Supplies both of rations and medical comforts were excellent throughout this period. On the other hand supplies of medical stores were distinctly bad. Quinine and other drugs began to run short at Damascus, and the situation was only saved by requisitioning independently at local drug stores. From Sthora a motor ambulance was sent into Beirut and procured further supplies from the 32nd C.C.S., but it was not till the end of October that it was possible to obtain supplies in the regular way from an advanced depot of medical stores at Beirut. This raises the suggestion whether on active operations medical stores could not travel up with ordinary supplies under the ægis of the A.S.C. This bald analysis of the medical arrangements can give no idea of the strain on the unit during this march. Take a typical day, such as October 12. The unit was up and at work in the dark at 04.30 hours, feeding patients, administering the general dose of quinine, and at dawn seventy patients were loaded up on to camels, ambulance wagons and four motors, and sent off six miles to catch the motor lorries. They made the journey, were back by 08.00 hours, loaded up another fifty patients and started off again. In the meantime tents had to be struck and the stores loaded, animals watered and fed and harnessed up, and at 08.30 hours the unit marched out in rear of its brigade to Tekkie. On arrival there tents were pitched again and very soon upwards of fifty more patients were admitted and receiving attention. And so it went on day after day. Considering that the work of handling patients fell on to two or three British N.C.O's and men, assisted by a handful of willing but untrained and unintelligent Indian bearers, and that most of these had intermittent fever themselves, their devotion, and that of the transport personnel who had to turn out at all hours cannot be too highly praised; the more so as the system of confining immediate awards to actions performed under fire, and the small chance of field ambulance personnel being noticed in dispatches, robs them of all hope of the recognition which such devoted service deserves.

After arrival at Baalbek the division remained stationary till the armistice with Turkey was signed. The sick-rate remained high for a few days, and the ambulance was now receiving all sick from the entire division, but no difficulty was experienced in dealing with them as the unit was camped next to the divisional refilling point and could avail itself of motor lorries



as they arrived. After October 21, the rate of sickness fell rather rapidly and the epidemic might be considered to be over. It had lasted three weeks with a death-rate of twelve per cent amongst those admitted from the 10th Cavalry Brigade.

## SECTION V.

### THE IMMOBILE SECTION.

The organization of the immobile section has been described in Chapter I. Its rôle was to act under the direct control of the A.D.M.S. as divisional collecting station, that is a unit which could receive casualties from the three mobile field ambulances of the division, hold them if necessary for a few days, and as soon as possible evacuate them either to one of the receiving stations under the control of D.D.M.S. Desert Mounted Corps, or direct to a C.C.S. The term immobile is therefore only relative, as it was able to transport all its stores by general service wagon while the personnel marched. Its history is divisible into three phases.

*A. The March to Beisan.*—The section was formed and detached from the remainder of the ambulance on September 17; it thus had no time for any sectional training or revision of organization in the light of knowledge of the march before it, which was explained for the first time at the A.D.M.S.'s conference that morning. The same evening it marched with the transport echelons of the division to Selme, remaining in bivouac there next day, and at dawn, on September 19, marched out in front of "B" echelon to the position of readiness, watering at the Nahr Auja en route. Leaving the position of readiness in rear of the 20th Brigade Ammunition Column at 10.00 hours, it soon began to get into difficulties in the sandy track which had been badly cut up by the division moving on ahead. No spare animals being available wagons had constantly to be halted, while lead pairs were detached from other wagons and the transport taken half at a time over the more difficult places: while some of the less important stores had to be dumped to lighten the load. The same difficulties were encountered and measures taken to meet them by the rest of the divisional transport, and by evening the section had only reached a point three miles north of the marshes at Ayun el Basse, where it bivouacked with the divisional train.

September 20.—A start was made at dawn but the going was still heavy and the mules, which had not been watered for twenty-four hours, began to flag. It was therefore decided to leave some wagons in charge of a guard and put an extra pair of mules to each remaining wagon and the water cart. After this better progress was made: the animals were watered at the Nahr Iskanderun at 15.00 hours, by dark Litkera was reached, and the section went into bivouac. The going had been much better in the afternoon, so the next morning teams were sent back for the abandoned wagons and the section marched to Sumrah with four mules to the team, arriving at noon and halting there for orders. These were received the next morn-

ing, and the same day the section marched to El Afule, halting at Lejjun to water and feed, and arriving at El Afule two hours after dark. At Lejjun a few captured Turkish ponies were annexed, and these proved a great help in carrying on some of the footsore personnel.

September 23.—Under orders from the A.D.M.S. the section marched to Beisan, arriving at 17.30 hours, and the next day it opened up as a divisional collecting station, taking over from the mobile section of the 10th Cavalry Brigade Cavalry Field Ambulance, which had carried on this work till its arrival. The small number of casualties in the division on the march to Beisan enabled the section to proceed there direct without opening. The lessons to be learnt were: (1) The ability of the Indian personnel to march the distance (eighty-five miles in five days) without much previous training; two men were left behind sick at Sumrah, but otherwise there were no casualties. The lack of training, in view of the distances to be covered, the heat and the absence of roads made it necessary to carry the kit of the personnel on the wagons most of the way. Allowance had been made for this in working out the wagon loads, but to lighten the wagons over the worst parts of the track (the average load had been worked out at 1,200 pounds) men carried their kits. (2) The inability of the four mules to pull a general service wagon through the heavy going. When, however, any sort of road surface was available four mules were quite adequate, and the two wagons left behind rejoined a few days later.

B. *Beisan to Damascus*.—(1) At Beisan the section was open for three days, receiving casualties from the division, 102 cases in all being admitted. These were evacuated at first by lorry and divisional motor ambulance convoy to the Australian division receiving station at Lejjun, and on the last day by motor ambulance and train to the Australian division receiving station at Afule. On the afternoon of September 26 the section marched to Jisr el Mejamie in rear of the divisional train, arriving after a bad march with frequent halts on the morning of September 27.

(2) At Jisr el Mejamie the section opened a dressing station in the station buildings, increasing the accommodation by tents. It was opened here for five days, receiving casualties by motor ambulance convoy from the 4th Cavalry Division in addition to a few sick troops passing through. No evacuation was possible for several days and the section was not now in communication with the A.D.M.S. of the division; but on October 1 all cases (less two dead and eight discharged) were evacuated by train to Haifa under arrangements made by the D.D.M.S. Desert Mounted Corps, and the next day the section moved under his orders to Semakh. From this point on the section passed out of the control of the A.D.M.S. and became for all practical purposes a corps unit, being used by the D.D.M.S. as an additional section to the 4th Cavalry Receiving Station.

(3) At Semakh the section was opened from October 2 to 8 as a dressing station for British casualties evacuated down the Damascus road, Indian

and Turkish casualties being dealt with by a section of the 4th Cavalry Receiving Station. It admitted here 137 British (chiefly from Australian Mounted Division) and twelve German prisoners of war. No evacuation was possible at first owing to the congested state of the hospitals at Haifa, but on October 7 fifty-one cases were evacuated to Haifa by rail and thirty discharged. On October 8 the remainder were transferred to the 4th Cavalry Receiving Station, and the section moved under D.D.M.S. orders to Rosh Pinna.

(4) At Rosh Pinna the section opened as a relay station for sick coming down the Damascus road, its duties being to feed convoys passing through and admit such cases as were unfit to proceed further. Little could be done, however, as at this point the section was decimated by an epidemic of fever. The personnel had been fiercely attacked by the mosquitoes at Beisan, Jisr el Mejamie and Semakh, and subsequent experience and the diagnosis of relapsing cases showed that most of this fever was malaria. British personnel suffered more severely than the Indians, and out of a total strength of twenty-one in the former, ten were evacuated, while all the remainder except two suffered from fever, the officer, Captain Thomson, included. On October 9 the section was ordered to Damascus, but being immobilized by the sickness amongst its drivers was unable to proceed till October 15, when the number of British remaining with the unit and recovered from fever was sufficient to drive the teams.

(5) Rosh Pinna to Damascus. On October 15 the section joined the 4th Cavalry Receiving Station as it passed through and started on the march to Damascus, which was successfully covered in four stages, halts for the night being made at Deir es Sawas, Kuneitra and Sasa. The long pull out of the Jordan Valley from Jisr Benat Yakub severely tried the mules, but otherwise they stood the march well, and watering was good. The march was marked by great devotion on the part of the British personnel: upwards of half the drivers had been lost from sickness, and few of the Indians proved capable of driving, so R.A.M.C. N.C.O.'s and privates, and Captain Thomson himself, though nearly all weak from fever, drove the teams and brought the section safely to Damascus.

C. *At Moallaka*.—The section was not opened at Damascus, and on October 20 moved by rail to Moallaka with part of the 4th Cavalry Receiving Station, the remainder travelling by road and arriving at Moallaka on October 22. Here buildings were taken over from 5th Cavalry Receiving Station, and all canvas was pitched in addition, the section working in conjunction with the 4th Cavalry Receiving Station. All sick from the 4th Cavalry Division now came to Moallaka by motor ambulance or motor lorry, but the great majority of the cases admitted here came in convoys by rail from Damascus, chiefly men of the Australian Mounted Division. A section of a field ambulance was thus by a strange inversion dealing with the evacuation of a casualty clearing station, the 66th Casualty Clearing Station being now stationed at Damascus, and convoys sometimes

reached 200 in one day. Evacuation was by motor lorry, supplemented by nine heavy motor ambulances of the 35th M.A.C., to the 32nd C.C.S. at Beirut, but it was not regularly maintained, being stopped for two days by order of the D.M.S. owing to the congested state of the hospitals at Beirut, and later being hampered by lack of sufficient lorries. Congestion thus occurred, the number of cases held up by the combined sections of Moallaka rising on one occasion to 540. Adequate feeding of these was, however, made possible by skilful organization and by the excellence of the supply arrangements of the 4th Cavalry Division, especially in medical comforts. From October 21 to 31 648 cases were admitted to this section of the 10th Cavalry Brigade Cavalry Field Ambulance alone, and considerably over 1,000 to the combined sections at Moallaka. The treatment, attention and feeding of these reached an exceptionally high standard for field conditions, to which testimony was borne by many officers and men who experienced it.

The casualties occurring to this section of the 10th Cavalry Brigade Cavalry Field Ambulance (i.e., cases evacuated) during the month of October were 14 British, 9 Indian and one mule, and 1,314 cases in all were admitted to it from September 24 to October 31. In November the number of cases admitted both from Damascus and the 4th Cavalry Division fell considerably, and on November 9 the section marched to Baalbek and rejoined the mobile section of the field ambulance there.

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## THE FORECASTING AND CONTROL OF CHOLERA EPIDEMICS IN INDIA.<sup>1</sup>

BY SIR LEONARD ROGERS, C.I.E., M.D., F.R.C.P., F.R.S.  
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GREAT BRITAIN has a weighty and world-wide responsibility regarding cholera. During the nineteenth century six great pandemics of cholera spread from India over Europe, and five of them reached America, that of 1840-49 carrying off one million people in Russia and 53,293 in England. The most important route is the overland one through the Punjab and Afghanistan to South Russia, the first great pandemic of 1826-37 having taken five years to travel from Bengal to South Russia in the absence of railways, but the last, in 1892, travelled from the Punjab to Russia in five months with more rapid communications. This may happen again at any time if nothing is done to control the spread in India itself, where severe epidemics continue to occur at irregular intervals, the causation of which has not hitherto been worked out, in spite of the accumulation of monthly cholera mortalities and meteorological data for all British-governed India over a period of from fifty to sixty years. After establishing close relationship between climate and the incidence of leprosy, tubercle, pneumonia and small-pox in India, enabling most epidemics of the last to be foreseen in future, I have now spent nearly two years in tabulating, charting and mapping out over 70,000 data regarding climate and cholera incidence in India, with results which appear to be of considerable practical importance, a brief account of which is given in this paper, with illustrative lantern slides of maps and diagrams to elucidate a somewhat complicated study.

### THE CENTURY-OLD THEORY THAT CHOLERA SPREADS OVER INDIA IN EPIDEMIC WAVES FROM BENGAL.

The first great Indian cholera epidemic of which we have good records began in Bengal in the latter part of 1817, declined as usual in the cold weather months in Western Bengal (now Bihar and Orissa), increased again as usual in March, 1818, and spread with a rapidity never since equalled north-west over the United Provinces to the Punjab, and south through Central India, Hyderabad State and the Bombay Deccan, overran Madras by the end of the year, and passed to Ceylon in January, 1819, the Indian Peninsula having been free from cholera for some years previously.

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## THE VIEWS OF BRYDEN AND CORNISH.

Later writers up to the present time have regarded the course of the 1817-19 epidemic as typical of later ones, and Bryden traced and mapped out several similar epidemics between 1854-68 for Northern and Central India, with which alone he dealt: while fortunately Cornish did the same



FIG. 1.

for the Madras and Bombay Provinces for 1859-70; so I have worked out a map (fig. 2), of the 1863-65 epidemic for all India. Bryden included in his Bengal endemic area, from which all cholera spread over India, Western Assam, all Lower Bengal, Orissa and Eastern Bihar, from which the disease spread in the first year of an epidemic over his Eastern epidemic area extending north-west as far as Agra, and travelled in the second year into the Punjab, this route constituting his northern epidemic highway; or it might spread to the Central Provinces in the first year, and in the second

to Sind and Gujarat by his southern epidemic highway as it did in 1863 and 1864, also infecting Bombay and most of Madras in the latter year as shown by Cornish; and in 1865 both the Punjab and the remaining south-east parts of Madras were overrun, thus completing the spread, an epidemic usually lasting four years before dying down again completely. As late as

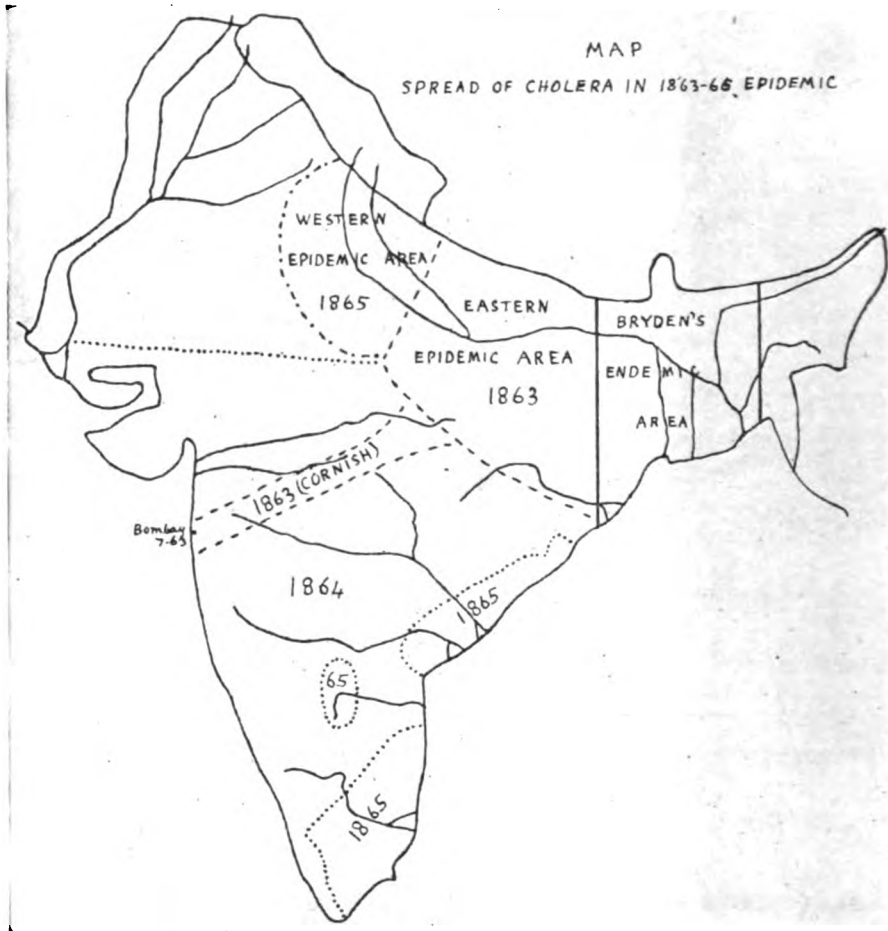


FIG. 2.

1925 the Acting Director of Public Health of Bengal informed the Office Internationale d'Hygiène that Bengal continues to be the home of cholera, from whence it spreads over India. I commenced my inquiry firmly imbued with the truth of this century-old theory, and spent much time in charting the monthly incidence for many years of different divisions of Bengal with comparative climatic data in order to try to discover the causation of the epidemics spreading from Bengal, but without success. Now Bryden,

writing long before the cholera vibrio was discovered, and with only Army and jail data, pointed out that the extension of cholera from Bengal over Northern India could not be explained as a spread through human intercourse, as the disease first increased in the sub-Himalayan divisions of the United Provinces with no railways in his day, and only became epidemic in the Punjab in June with the onset of the monsoon. These facts have never been hitherto explained, because the climatic factor which I have found responsible was not then known, and this factor throws an entirely new light on the whole subject of cholera epidemiology.

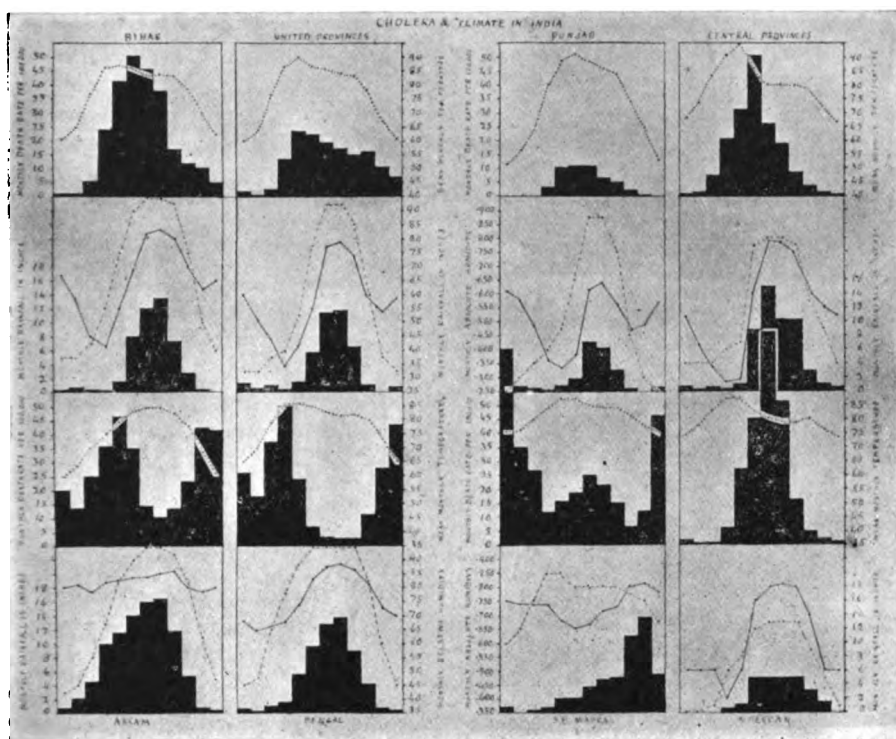
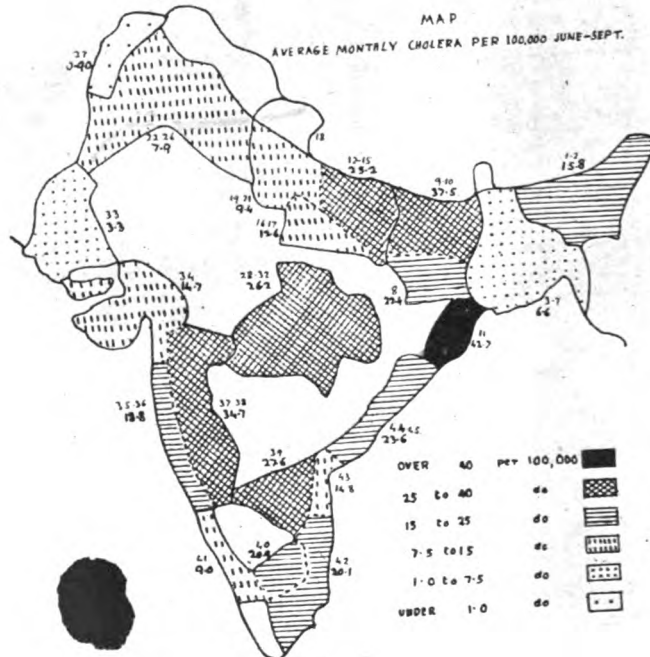
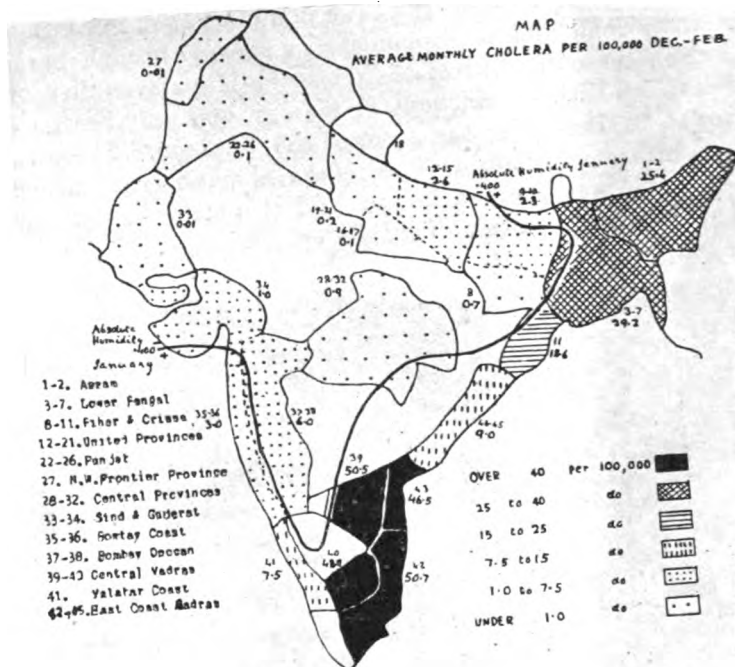


FIG. 8.

### THE SEASONAL INCIDENCE OF CHOLERA IN INDIA IN RELATION TO CLIMATE.

The two outstanding facts in cholera distribution in India are: (1) the remarkably similar monthly incidence of the disease in each area year by year, although this differs most widely in different parts of India; and (2) the extraordinary variation in the annual incidence of the disease from year to year in the areas liable to epidemics, which has several times amounted to a thousand-fold increase in a whole province in a single year, quite irrespective of the small variations in the sanitary conditions from year to





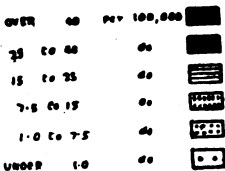
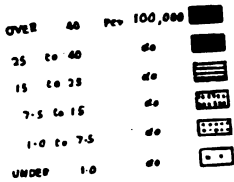
FIGS. 4 AND 5.

year. We must evidently first ascertain the reasons for the seasonal variations, for which purpose I worked out the average monthly incidence over a series of years, both for the different provinces and for a number of smaller areas, and studied these in relation to the monthly climatic variations. The results were most instructive, the provincial data being illustrated in the accompanying chart (fig. 3), together with maps giving the rates per mille in each area for the different seasons.

The first point to note is the totally different seasonal incidence in Assam, Lower Bengal and Madras from that of all the rest of India, for in Assam and Lower Bengal cholera is at its minimum during the floods of the south-west monsoon from July to September, rises to its first maximum from October to December, falls in January and February, only to rise to its second maximum from March to May, while in south-east Madras the main rise is in December and January, when the disease is at its minimum in all central and north-west India. In the other provinces cholera is at its minimum in the late autumn and winter months, the single yearly rise commencing in March in Bihar, the sub-Himalayan United Provinces divisions, and in the Eastern Central Provinces; in April in the rest of the United Provinces and the Deccan, but not until May in the Punjab: all pointing to a steady spread from Bengal through Bihar and the United Provinces to the Punjab, although the mystery remains, as pointed out by Bryden, that this apparent spread has not become more rapid with the advent of railway communications, so could not be explained as arising by human intercourse.

Reference to the climatic data shows at once no relationship between seasonal cholera incidence and either rainfall, mean temperature or relative humidity, but when we turn to the absolute humidity data we find the clue to the problem. Now, by absolute humidity is meant the actual amount of moisture in the air as measured by its vapour tension in terms of mercury, and it is essentially a measure of combined heat and moisture, low readings, such as under 0.400, indicating both great dryness and fairly low temperature and vice versa. In the accompanying map (fig. 4) is shown the 0.400 absolute humidity line in India in January, that of February being almost the same, and it will be seen at once that Assam, Lower Bengal and south-east Madras are just those parts where the absolute humidity never falls below 0.400, and they are the only areas with high cholera incidence from December to February, when it is at its minimum in the rest of India. A further map (fig. 6) shows that the absolute humidity first rises to over 0.400 in March in Bihar and the sub-Himalayan divisions of the United Provinces, and next in April in most of the rest of the United Provinces, but not in the Punjab, except in the extreme north-west until May, exactly in the order in which cholera becomes epidemic. Further, the hitherto unexplained temporary decline of cholera in Assam and Lower Bengal in January and February is due to the near approach to the critical 0.400 absolute humidity in those months.

## Forecasting and Control of Cholera Epidemics in India



FIGS. 6 AND 7.

The question whether cholera really spreads yearly from Lower Bengal clearly requires reconsideration in the light of this striking new factor in the problem, as it opens up the question whether it is a spread from Bengal, or whether only a recrudescence with the rising absolute humidity in areas where it is only temporarily suppressed during the low winter absolute humidity. We, therefore, require to define more closely the real

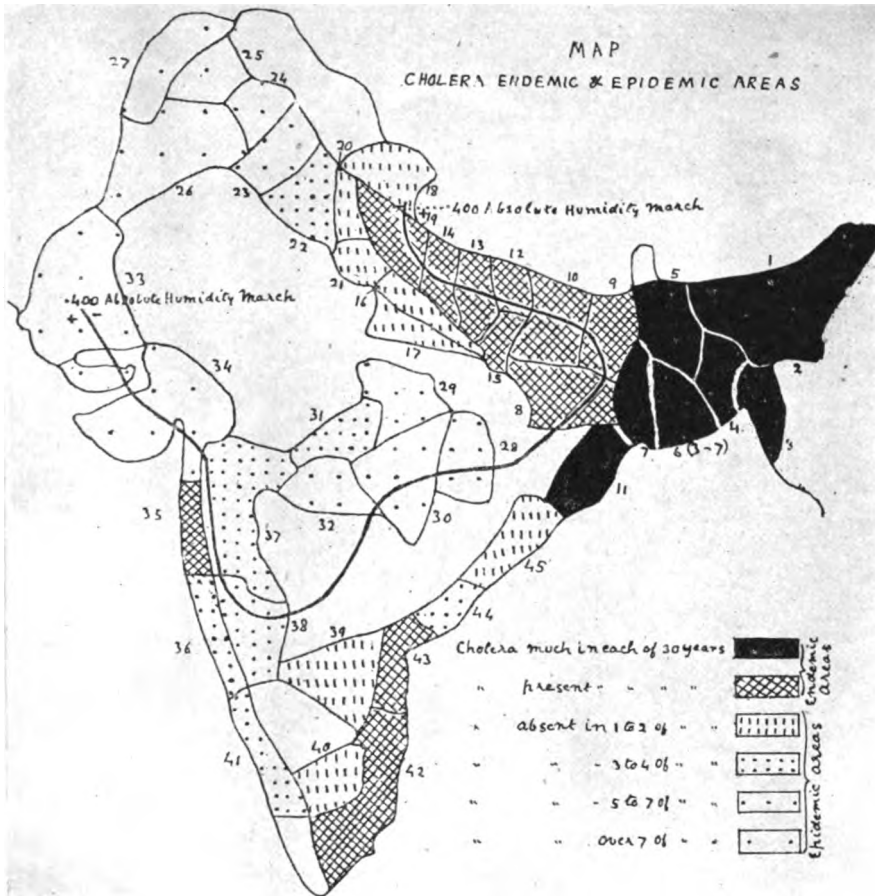


FIG. 8.

endemic areas than has hitherto been done ; for this we now have abundant data in regard to the general population mortality figures which were unknown in Bryden's day.

#### THE ENDEMIC AND EPIDEMIC CHOLERA AREAS OF INDIA.

For this purpose I have worked out the data of forty-five divisions for three recent decades with reliable data, and noted in how many years cholera

was absent from each. All the areas which were never free for a single one of the thirty years are shaded dark in the map (fig. 8) to indicate that they are true endemic areas, and the others are shaded more lightly in accordance with the increasing number of years of complete freedom from cholera. The results are most instructive. They show in the first place that Bryden's one Bengal endemic area forms but about half of one of three

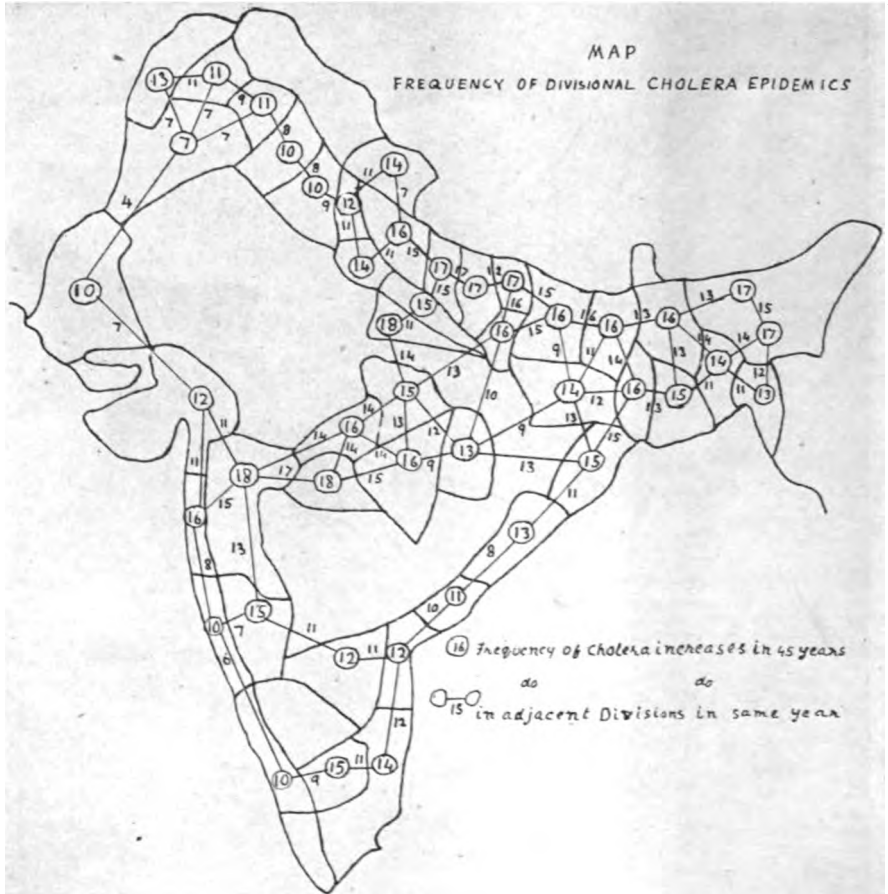


FIG. 9.

endemic areas at the present time, and Western Bihar and the whole of the eastern and sub-Himalayan divisions United Provinces form part of the great Assam-Bengal-Bihar and Orissa United Provinces endemic area. It thus becomes clear that the March rise in Bihar and the sub-Himalayan United Provinces is a recrudescence in an endemic area, and not an epidemic spreading from Lower Bengal. This all-important fact is confirmed by a glance at the map (fig. 9), in which I have entered in each division the

number of epidemic rises in forty-five consecutive years, which show only from 13 to 16 rises in Lower Bengal, but no less than 17 in the sub-Himalayan United Provinces, as well as in Assam, which could not have arisen from a smaller number in Lower Bengal, as recrudescences in one year of an epidemic commencing in the previous one have not been counted. The other great endemic centre is the whole of the south-east of the Madras Presidency, while a third smaller one exists in the low-lying North Konkan coast districts of Bombay. It is most significant that these last two areas, as well as Assam and Lower Bengal, never have an average monthly absolute humidity below 0.400, while in Bihar and the sub-Himalayan divisions it first rises above that point. The apparent spread of cholera from Bengal is thus far better explained as a recrudescence in endemic areas after temporary suppression by low absolute humidity.

It is of very great interest to note that the earlier Sanitary Commissioners of the United Provinces recognized cholera to be endemic there, and C. Planck, after pointing out that year by year the disease became epidemic in regular order from east to west, continues thus: "But the facts of cholera registration, although they witness in every year the same peculiarity of epidemic prevalence, do not witness any gradual spread of the disease from east to west. Their evidence only tends to show that from some peculiarity of climate, or other unknown condition, the disease becomes locally *epidemic* later in the year, as the districts are more westerly." But cases are always "present from end to end of the Province, apparently ready for increase when favouring circumstances occur." Substituting "absolute humidity over 0.400" for "some peculiarity of climate," a more striking anticipation of any conclusions could hardly be imagined, although I only read Planck's reports months after working out my absolute humidity and endemic area maps.

#### THE EPIDEMIC AREAS.

Now that the endemic areas of constant cholera have been fairly accurately defined, we may turn to the typically epidemic ones, from which cholera has so completely died out for a year or two at a time that the cases returned as cholera by the village watchmen fell below 0.01 per mille, and there is strong evidence that such isolated returns are rarely true cholera. The areas from which cholera has been absent, as just defined, from three to seven or more of thirty consecutive years, include all the Punjab, Sind, Gujarat, the Central Provinces, and the Deccan, while in all, except the Deccan, the Nerbudda division of the Central Provinces and the eastern Umballa division of the Punjab, the years of absence amounted to five and over, so the Punjab and the Central Provinces form the two most important epidemic areas for studying epidemic invasions from neighbouring endemic areas later in this paper.

THE FREQUENCY OF EPIDEMIC CHOLERA IN ADJACENT DIVISIONS IN  
RELATION TO ITS SPREAD.

As I soon found that smaller areas than whole Provinces must be studied if the spread of cholera was to be traced, I spent many months in working and mapping out the annual cholera incidence per mille for forty-five years for forty-five divisions of British-governed India, and I have entered on a map (fig. 9) the number of definite rises of incidence in that period in each division, together with the number of years in which the rise took place simultaneously in two adjacent areas, with very instructive results, only a very few of which I have time to allude to. I have already mentioned the larger number of epidemics in the United Provinces than in Bengal, from which they could not all have originated, but the number falls from 17 in Oudh, etc., to only 7 to 11 in the Punjab divisions, but 13 in the North-West Frontier Province with a higher April absolute humidity; so it is clear the Punjab outbreaks may have arisen from the United Provinces, as we shall see later is almost invariably the case. Again, there were 15 rises in Orissa, with the highest cholera incidence in India, due to the Puri pilgrimages, and 13 in the neighbouring eastern Chattisgarh division of the Central Provinces, every one of the 13 being among the 15 epidemic years in Orissa, from which they were derived. Similarly, of the 18 rises in Berar, 17 occurred among the 18 epidemic years in the adjacent North Deccan, whence the disease has often been traced, and once more 14 of the 15 epidemics in the northern Jubbulpore division occurred among the eighteen years of high prevalence in the neighbouring Jhansi division of the United Provinces south of the Jumna; so the Central Provinces are invaded from all around, as I shall illustrate by a map later. Similarly, Gujarat and Sind are usually invaded from the North Deccan and Konkan divisions to the south, but occasionally Sind is infected from the Punjab to the north, when the disease begins in the north of Sind. The value of this line of study is thus clear, although it has been singularly neglected owing to the sanitary reports of each Province being prepared in ignorance of those of the same year in adjacent ones.

## THE SPREAD OF CHOLERA IN 1875-77 FROM THREE ENDEMIC CENTRES.

The best account I have been able to find of the spread of cholera over India in recent times is that of S. C. Townsend, when acting Sanitary Commissioner in India, from which I have worked out a map (fig. 10), clearly showing that the disease spread from the north-east endemic area over the eastern Central Provinces, and north-west to the Punjab; from the Bombay-Konkan endemic area through the Deccan into the west of the Central Provinces, largely by the Nasik pilgrims, and from Ceylon, or the extreme south of Madras, northwards through nearly the whole of that Province: thus illustrating the quite independent spread from the very three distinct endemic areas I have mapped out, and consequently showing that at least fifty years ago the theory of spread all over India from Bengal was no longer true.

*(To be continued).*

# EXTRACTS FROM THE REGULATIONS FOR CONTROLLING THE HEALTH OF THE TROOPS DURING A PERIOD OF "CONCENTRATION" AND IN THE "FIELD."

BY CAPTAIN AND QUARTERMASTER G. A. COLLIER.

*Royal Army Medical Corps.*

*"The health of the fighting men of the force is of paramount importance, and every effort should be made to safeguard it from the onset."*—Surgeon-General W. W. PIKE and Colonel A. BALFOUR.

MOBILIZATION is the process by which a force passes from a peace to a war footing, and several days are required to complete the process. The *first* day of this period is the day following the publication of the order to mobilize.

On mobilization being ordered the following medical questions arise :—

- (1) Are all the men fit?
- (2) Are arrangements made for immediate medical inspection of all men present and for those joining, especially for those units which have not a medical officer on their war establishment?
- (3) What is the state of vaccination and inoculation?
- (4) Has accommodation been allotted for the men joining to complete the unit's establishment?
- (5) Are barbers and chiropodists, baths, clean clothes and arrangements for steam disinfection available? <sup>1</sup>
- (6) Is the authorized regimental personnel, for medical assistance, sanitary and water duty men, ready and trained for their work?
- (7) Is the medical and ordnance equipment for the medical officer available and ready for use? (Regs. M.S.A., para. 334; Equip. Regs., para. 154).

*Personnel.*—The medical officer detailed for duty with a unit is due to arrive at the place of joining on the first day of mobilization.

Following the initial medical inspection of the personnel, action is necessary to collect and perfect that part of the unit's equipment with which the medical officer is immediately concerned. He should ascertain that the medical and ordnance equipment, stretchers and armlets for the stretcher bearers, are available and complete, and also that the unit sanitary and water personnel, and stretcher bearers, are detailed for and are familiar with their duties (Field Service Regs., vol. i, 1923, Secs. 178, 183).

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<sup>1</sup> If the A.D.H. cannot arrange for the whole of the disinfection at a local disinfection centre, Serbian barrels are most easily made.

The Box Disinfector, Mark II, and the Sack Disinfector are an Ordnance supply.



With the concurrence of the commanding officer arrangements should be made to give instruction to the unit on the use of the first field dressing (Field Service Regs., vol. i, sec. 186), and on the application of the principles of hygiene to active service conditions, special reference being made to the climatic conditions and necessity for individual effort to minimize the effects of exposure to infection. His duties with the unit, and those of the trained subordinate personnel, are summarized in the Field Service Pocket Book, 1926, sec. 40, paras. 8 to 12.

The numbers of men by the various arms of the Army, to be trained as stretcher bearers and in first aid to the wounded, are given in King's Regs., para. 838. Stretcher bearers' armlets, lettered "S.B.," are included in the mobilization equipment.

The distribution of this part of a battalion's personnel is:—

Headquarters wing:—

Stretcher bearers—1 serjeant and 5 men. Water duty and sanitary duties—6 men from the pioneers.

Medical officer's orderlies—1 lance-corporal and 2 privates; one drives the Maltese cart and the other is a batman.

Chiropodist—1.

Each company:—

Stretcher bearers—4 men.

Sanitary duties—2 men.

It follows that to carry out effectively these duties in the time available, a scheme for dealing with the situation, which must conform with the unit's time-table, should be considered by the medical officer concerned. Assuming that the medical officer can satisfactorily inspect twenty men an hour, by working twelve hours a day it would take three days to inspect a unit of 720 men.

It is possible, therefore, that some assistance would be necessary to have this work done more expeditiously and to deal with vaccinations and inoculations, thus liberating the unit's M.O. to attend to other regimental arrangements. The provision of rubber stamps to complete the M.H. Sheet and A.F.B.64 of each soldier would facilitate this part of his work.

Medical inspections are carried out each day of the mobilization period. On the first day of mobilization, every officer and soldier is to be examined to ensure each individual's fitness for general service. The medical history sheet of the soldier will be completed at Table VI, as directed in Regs. M.S.A., paras. 94 and 461, and A.C.I. 797 of 1920.

Special regard should be given to reservists joining who are to be employed as cooks or for handling food. The medical certificate required before a man is trained as a cook is given on A.F.B.114 and states that: "No entry of dysentery or typhoid or paratyphoid fevers appears on the candidate's medical history sheet and there is no evidence of venereal disease."

The medical officer, when carrying out the medical inspection, will

satisfy himself that each officer and soldier is efficiently protected against small-pox by vaccination and by inoculation against typhoid fever (Regs. M.S.A., paras. 397, 405 and 410). In cases where such protection does not exist, *every endeavour* will be made to carry out the necessary vaccination and inoculation at the earliest possible moment (Mob. Regs., para. 137, F.S.P.B., sec. 41, paras. 39 to 41).

When an officer joins a unit other than that with which he is serving in peace, the O.C. the unit to which he is appointed will ensure that, on joining, he is *at once* medically examined as to his fitness for service with that unit (Mob. Regs., para. 124).

Medical inspection must precede the movements of individuals or parties from one unit to another (Mob. Regs., para. 145).

Every reservist who joins at a depot will undergo a preliminary medical inspection sufficient to detect any medical unfitness which is readily discernible. Each reservist will at the same time be carefully examined for the presence of vermin. Should a reservist be found to be infested he will be given a clean set of underclothing and, if practicable, a bath.

The bath places should be provided with nail-brushes, soap and towels. Sacks are required for cast-off clothing and arrangements must be made for the disinfection of the articles before they are handed over to the contractor.

The men's hair should be cut short (King's Regs., para. 948) before going to the baths.

A trained orderly in attendance during the bathing could detect vermin; at the same time cases of scabies, impetigo and venereal disease should be looked for.

The regimental chiropodist should examine every man's feet and bring to notice any case requiring the medical officer's attention (Regs. M.S.A., para. 389).

Fifty pairs of canvas shoes will be carried by each infantry battalion for issue on medical recommendations to men suffering from sore feet (Clothing Regs., 1926, Appendix XV. para. 19).

Reservists found temporarily unfit will be re-examined after one month and subsequently at such dates as the D.D.M.S. concerned may direct (Mob. Regs., para. 187, and Regs. M.S.A., para. 481).

When reservists join a unit direct they are carefully examined for the presence of vermin and undergo the usual medical examination as to fitness for general service (Mob. Regs., 144 and 137 (ii) and (d), and Regs. M.S.A., para. 478).

Immature and unfit personnel, including men under 19 years of age, are placed in the home details of the unit.

The final medical inspection of the unit is made not later than 6 a.m., on the day of entrainment or embarkation (Mob. Regs., Appendix "G," p. 112, King's Regs., paras. 1092 and 1094).

*Accommodation.*—Detailed information regarding the arrangements for

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accommodation of troops in the United Kingdom is contained in Quartering Regulations, 1917.

The following extracts are a guide to the selection of billets when extra accommodation is a necessity.

Before proceeding to allot billets, chief officers of police should consult the medical officer of health of the town or district.

The sanitation, not only of the actual premises proposed for occupation, but also of the neighbourhood in which they are situated, must be approved by a medical officer.

For the calculation of accommodation in large buildings fifty square feet of floor space should be allowed per soldier, the minimum space being forty superficial feet and 400 cubic feet of space for each man's sleeping quarters. In dwelling houses not more than one man to every two rooms should be allotted, not including kitchen and offices. When billets are found to be unsuitable, insanitary or infested with fleas, lice, etc., they should be vacated at once.

When existing barrack accommodation is insufficient to meet requirements during the mobilization period, it will be supplemented by using public buildings, billets and camps.

Before billeting can be carried out it is necessary for an order to be made by His Majesty under Section 108A of the Army Act authorizing general or field officers to issue billet requisitions.

In the case of troops quartered in large numbers on any premises where there is an insufficiency of kitchen and cooking appliances, the troops will supplement existing appliances by the construction of field kitchens.

Reasonable expenditure incurred by hiring premises for central messing is admissible.

As a general rule, troops will be supplied with rations at the public expense. They will be in possession of blankets, three if without beds and one if bed and bedding are available; an issue of straw will be made to them until palliasses can be distributed.

When there is not sufficient latrine accommodation, arrangements will have to be made to improvise means up to the scale of four seats for every 100 soldiers (Mob. Regs., paras. 90 and 160A, and Appendix "C").

*Clothing.*—The kits of all soldiers are inspected; any replacements found necessary will be on payment out of the clothing allowance (Clothing Regs., 1926, Appendix XV).

The special articles, including first field dressings and ration bags, which are stored with the mobilization equipment, are issued on the third day, to soldiers who are found "fit" (Mob. Regs., 1926, para. 153 and Appendix "G."). Soap will be supplied free to all ranks as required; one three-ounce piece will be carried by each man (Equip. Regs., Part 1, para. 313).

The fitting of clothing commences on the first day. Service dress clothing is fitted loosely. The proper fitting of boots is a matter of the first importance and C.O.'s will be held responsible that this is carefully carried out (Clothing Regs., Appendix XV).

The O.C. the unit will see that all officers and soldiers are properly fitted with anti-gas respirators. When mobilization containers are issued (third day) he will see that they are immediately substituted for all training containers (Mob. Regs., 1926, para. 133).

For a long sea voyage each man will be supplied with a sea kit bag, into which the following clean articles are to be packed: Drawers, pair 1; flannel shirt, 1; socks, pair 1; towel, 1. These articles are for use on the voyage and will be repacked in the bag and handed over to the ordnance officer at the port of disembarkation (Mob. Regs., 1926, para. 57; Clothing Regs., 1926, Appendix XV).

Reservists are issued with personal clothing and necessities when passed "fit" (Mob. Regs., para. 144).

Reservists will make their own arrangements for the disposal of their plain clothes. Paper, string and labels are available for use of men who desire to send their plain clothes home (Mob. Regs. para. 92 and 189).

The dress for active service is laid down in King's Regs., para. 963 (4). The scale of clothing and necessities for each man is laid down in Clothing Regs., 1926, Appendix XII.

*Medical Equipment.*—The scale of medical equipment for units of an expeditionary force is shown in Regs. M.S.A., Appendix XLVI.

The officer commanding will see that the medical equipment required to complete the war outfit of the unit, if not already in his possession, is obtained. The cases for water testing (poisons and sterilization) are stored with the bottles empty. They are filled before issue.

This equipment is thoroughly examined twice a year and, whenever possible, officers detailed for duty with a unit on mobilization are selected for this duty. It is stored in or near the local military hospital.

*Ordnance Equipment.*—A Maltese cart, or a limbered general service wagon or motor van, light (according to the arm), is provided for the transport of the medical equipment (Field Service Regs., vol. i, sec. 183). It is taken over by the medical officer on the first day. A general service pannier is included in the scale and contains the several small articles of equipment, e.g., lamps, oil stoves, kettle, saucepan, pannikins, etc.

The medical comfort pannier is stored at the military hospital and issued complete. A detail of accessories is given in Equip. Regs., Appendix XXVI, and a list of contents in the Field Service Manual, A.M.S. The water carts are inspected by the medical officer on the first day and handed over to the water duty men on the third day. The pumps may not act properly at first, but after being well soaked they are satisfactory. An inventory of components, accessories, spare parts, is shown in the Equip. Regs., Appendix XV. Water sterilizing and clarifying powders are not stored with the mobilization equipment; they are issued by the officer in charge of supplies when necessary. Other stores such as oil, wick, candles, disinfectants, carbolic soap and toilet paper can be obtained as required by the quartermaster (Equip. Regs., Part 1, para. 156 and 169). A list of

authorities to whom indents should be forwarded is given in the F.S.P.B., 1926, Appendix V.

*Rations.*—The peace scale of food is issued to all ranks until instructions to the contrary are promulgated (Mob. Regs., 1926, para. 95).

The mobilization scheme includes arrangements for supplies and feeding during the period of mobilization.

Unit reserve supplies (landing ration) consisting of one day's supply for man and horse is issued at the place of mobilization and carried by the unit, as a reserve, for use on the day following landing (Mob. Regs., 1926, para. 98).

For short sea voyages each man will carry on his person, on leaving the place of mobilization, two days preserved rations for use in case of delay in embarkation or during the voyage (Mob. Regs., para. 96).

The iron ration is sent from Supply Reserve Depot to the officer in charge of supplies at the port of embarkation, who will issue in bulk to the officer commanding troops on each ship, for distribution during the voyage (Mob. Regs., para. 97). This ration is issued to every man in a field unit and is carried on his person (Field Service Regs., vol. i, sec. 152 (3)). The ration is described in Allowance Regs., para. 34.

Haversack rations for a train journey are mentioned in Mob. Regs., para. 96. Refreshments, if required, during a long rail journey must be ordered in advance and paid for on receipt.

Whilst troops are stationed in barracks they assist in the hygiene arrangements of the unit, but the essential sanitary services are managed by the several departments concerned, viz., the Royal Engineers, the Royal Army Service Corps and the Royal Army Medical Corps. Consequently the soldier cannot fully appreciate the work which is being done with the deliberate intention of increasing his efficiency, and is apt to overlook the necessity for personal effort to secure himself, and his "unit," against the ills of insanitary actions.

A high standard of efficiency can be maintained, and the medical officer and sanitary personnel are greatly assisted in their efforts when the officer commanding and company commanders display a special interest in the unit's hygiene and sanitary arrangements.

When good regimental arrangements are made for daily supervision of sanitary work, the officer commanding is relieved from the immediate care and worry of the unit's domestic service.

## Editorial.

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### SPIROCHÆTAL JAUNDICE.

SPIROCHÆTAL jaundice has considerable interest for the officers of the Royal Army Medical Corps. It will be remembered that in the autumn of 1915 medical officers serving with the armies in France met with severe cases of fever with jaundice, especially among men in the trenches. The cause of this disease was found to be the *Leptospira icterohæmorrhagiæ*, which was shown by Captain Adrian Stokes to be present in the rats caught in the battle areas in Flanders. In the "Medical History of the War" there is a detailed account of infective jaundice as it occurred amongst our armies. The subject has received added interest by the occurrence in 1923 of several cases of spirochætal jaundice in Scotland, first reported by Professor Lovell Gulland and Dr. George Buchanan. The disease appeared among coal-miners in East Lothian, and corresponded, as regards its incidence in wet mines, to the similar infection among mine workers in Japan, where the spirochætal origin of infective jaundice was worked out in 1915 by Inada and his fellow-workers. The appearance of the disease in Scotland gave rise to many questions of epidemiological interest and industrial importance, and Dr. Buchanan, with financial assistance from the Medical Research Council, has made an extensive study of the infection, and the results of his investigations have just been published by the Medical Research Council. In the historical section of the report we are reminded that the epidemic form of jaundice appears to have been first recorded by Cleghorn, who reported its prevalence in Minorca in 1745. It occurred in America during the war of 1812, and French writers have described epidemics at various times from 1846 up to 1886. Outbreaks in Europe are stated to occur most frequently among young adults, particularly among soldiers, butchers and sewermen. It is probable that two distinct types of disease have been confused, epidemic and catarrhal jaundice. In 1886 Weil published an account of four cases of infectious jaundice, and subsequently the disease presenting the symptom-complex of fever, jaundice, enlargement of liver and spleen, the occurrence of hæmorrhages and occasional febrile relapses has frequently been referred to as Weil's disease. In November, 1914, Inada and Ido discovered a spirochæte in the liver of a guinea-pig inoculated with the blood from a patient suffering from the Japanese form of Weil's disease, and proposed the name *Spirochæta icterohæmorrhagiæ*.

Inada and Ido demonstrated the spirochæte in the blood of six patients. They also detected it in sections of the intestinal wall and suprarenal of

two out of the eleven patients, and in two other patients spirochætes were found in the liver. The elimination of the spirochæte in the urine was stated to occur from the thirteenth to the fortieth day from the onset of illness. Moreover, in the blood of five recovered patients they demonstrated the presence of specific protective, curative, and spirochæticidal substances by means of animal experiments.

In 1915 Uhlenhuth and Fromme announced that Weil's disease occurred amongst German soldiers during the Great War, and could be communicated to guinea-pigs by inoculation of the patient's blood. Amongst the French soldiers on the Western Front the prevalence of the disease was confirmed, and the spirochæte isolated was considered to be very similar to the Japanese type. The disease on the Italian Front was reported by Monti, and later by Sisto, in 1917. Since the end of the war epidemic and sporadic cases of spirochætal jaundice have been reported in many countries.

Buchanan's inquiry was commenced in 1923, and since that time he has investigated fifty-one cases of suspected spirochætal jaundice in Scotland. The disease was diagnosed in twenty-two cases, mainly on the manifestation of certain clinical features along with the presence of the spirochætes in the urine; and confirmed in some instances by transmitting the disease to animals inoculated with the urine. Eight of the twenty-two positive cases were among coal-miners. Later, the existence of the disease was proved in other members of the community in Scotland, particularly in those working in rat-infested areas.

There was nothing very noteworthy about the clinical manifestations in any of the cases. The symptoms agreed in the main with the account of the disease in other countries. Hæmorrhagic herpes labialis, however, was only found in 5 per cent of the patients in Scotland, while in other accounts this symptom has been present in from 40 to 43 per cent of the cases.

The spirochætes are stated to be present in the blood of human cases during the first seven days of the illness. According to the Japanese workers, and Stokes, Ryle and Tytler, inoculation of guinea-pigs with suspected blood withdrawn on the fourth day of illness gave 100 per cent positive results. Previous to and after the fourth day the percentage of positive results was much lower.

Buchanan's attempts to establish the diagnosis by means of microscopic examination and inoculation of suspected blood into animals were not successful in any case; he therefore concentrated on examination of the urine in which the spirochæte is said to be demonstrable microscopically from the ninth day up to about the fortieth day of the disease. He also employed animal experiments with the urine. Spirochætes were found in the urine of seventeen patients between the eighteenth and twenty-third day of illness. In each instance the organisms were detected with difficulty by dark-ground illumination. The fine spirals were not recognized; the forms observed could only be regarded with suspicion as of the leptospiral

type, so that it was necessary to rely on the results of animal inoculation for confirmation. Forty-four animals, including four mice, were employed, but only one showed a definite positive result. Seven other animals showed "spotted" lung hæmorrhages, which lesion is considered by Inada an important diagnostic sign of the disease in animals. The failure to infect was thought to be due to the devitalizing effect on the leptospiræ of the acid and bile in the urine. Noguchi also noted that strongly acid urine and the presence of bile were inimical to the leptospiræ at the end of twenty-four hours. Buchanan concludes that in a case of jaundice, the clinical features of which suggest the spirochætal type, and in the urine of which granular forms of spirochætes are found, the chain of evidence is strong enough to justify the diagnosis of spirochætal jaundice.

Having definitely proved the existence of true spirochætal jaundice among the coal-miners and other members of the general community in Scotland, Buchanan carried out a number of investigations to determine the origin and spread of the disease.

The part played by rats in harbouring and distributing the spirochætes has been established by observers in several countries, and it seemed probable that rats were the cause of the cases occurring in the Lothian mines in Scotland. Arrangements were made to obtain a few rats from the coal mines in which cases of jaundice had occurred, and in the kidney of two out of these rats received at this period leptospiræ, virulent for guinea-pigs, were found.

Buchanan then proceeded to make an examination of wild rats, chiefly from the Edinburgh district. The total number examined was 166; all the rats appeared well nourished and no signs of the disease appeared in the kidney or in other organs. Of the 166 rats, 36·7 per cent were found to be infected; the organism when present was found only in the kidney or urine. This result is of great interest in view of the cases of jaundice which have occurred in persons working near such rat-infested areas as refuse dumps, piggeries, and breweries.

An examination of the coal mines in East Lothian where spirochætal jaundice had occurred was then carried out. Small, stagnant muddy pools were present from which samples were collected, and a slimy, viscid substance was found on the roof and formed a small thin layer in certain areas. This roof slime was shown by dark-ground examination to contain undoubted typical leptospiræ, and two guinea-pigs inoculated showed pronounced evidence of spirochætal jaundice. Abundant leptospiral organisms were present in all the organs examined and an appreciable number was also found in the blood and urine.

This is the first occasion in which direct inoculation of a water leptospira has proved pathogenic to guinea-pigs. The infected roof slime was found growing on slaty stone and wooden roof-bars in absolute darkness; it was greyish-brown in colour and formed a mass of considerable coherence; it was slightly alkaline when tested with litmus paper and had a reaction of pH 7·5 approximately.



Other types of spirochætes were much more numerous in the slime, but the characteristic motility of the leptospira, in contrast with that of the other spirochætes present, was striking and formed a feature which distinguished it from forms closely resembling the genus. The slime was observed in very damp and old sections of the mine, and its situation on the roof appeared inaccessible to rats, but Buchanan was informed by the pit manager that at the time of the outbreak of jaundice in May, 1923, practically all the infected miners were working in a particular section which happened to be that branch of the mine in which the infected roof slime was found. Rats were never considered numerous in the pit, but one caught on the pit surface was found to be infected with pathogenic leptospiræ. It seems possible that the slime may drop from the roof on to the ground into stagnant pools, from which source man and rat alike may conceivably become infected. Similar organisms of leptospiral type have been discovered in local reservoirs, lochs and sewage water, and in several coal and shale mines. There appear to be two distinct types of leptospira—a water or saprophytic type and a pathogenic type. Buchanan's work on the possible mutation from saprophyte to pathogen is incomplete, but he thinks this may possibly occur in certain natural environments. That the absence of favourable and adequate organic matter in the water may be a factor in the attenuation of a pathogenic leptospira was confirmed by Toyama in 1924; he found a pathogenic strain became attenuated in experimental ponds with no soil, but preserved its virulence for a longer period in ponds with soil. Zuelzer, in 1912, discovered in tap-water spirochætes which morphologically resembled those of Weil's disease, but direct inoculation of the naturally infected water into animals did not give rise to any symptoms. One strain proved pathogenic to guinea-pigs after cultivation in a serum medium for one and a quarter years—that is, mutation from saprophyte to pathogen had apparently occurred.

In January, 1925, Buchanan examined samples of water from reservoirs and fresh-water lochs in Edinburgh. Leptospiræ were found in certain samples as well as in sewage water. In the Metropolitan Water Board report for the year ending March, 1926, Sir Alexander Houston reported the presence of leptospiræ in various waters, but all the cultures when used to inoculate animals yielded negative results, save one.

The sample of water which yielded positive results was tested by Dr. Okell. The source was the Deptford (garden) Well which has always yielded excellent results, chemically and bacteriologically. There were many rats in the vicinity of the well, and one of these was caught alive and found to harbour virulent leptospiræ. Houston does not see how leptospiræ, either from the rats or from the River Ravensbourne, which runs close to the well, could reach the supply. The pumping well is ninety-five feet deep and the water practically never contains *B. coli*.

Okell inoculated a white rat with the centrifugalized sediment from the original sample; it showed no sign of the disease, but forty-one days later

it was killed and fairly numerous leptospiræ were seen in the kidney. One cubic centimetre of this ground-up kidney was inoculated into each of four guinea-pigs intraperitoneally, and into one guinea-pig subcutaneously. They all died of leptospiral jaundice. Two guinea-pigs were scarified with the material from the rat's kidney and also died of jaundice; leptospiræ were present in the liver and a pure culture was obtained in Noguchi-Wenyon medium.

It would thus seem that leptospiral organisms exist as saprophytes in certain waters and mud. Akira Shiga has recently recorded serological differences between certain water strains and *L. icterohæmorrhagiæ*. The latter is stated to thrive in the immune serums of the former, but not in its own immune serum. The different races of water leptospiræ tested were likewise only affected by their homologous immune serum; both being uninfluenced by the immune serum of the pathogenic strain.

Uhlenhuth and Grossmann point out that spirochætal jaundice in human beings is always localized and is generally connected in some way with polluted waters. The infection in rats, however, is world-wide in its distribution. They suggest that there exist in water two distinct, though morphologically indistinguishable, organisms, the one a true non-pathogenic type and the other the actual organism of Weil's disease. Rats which have frequent opportunities of becoming infected from water readily develop into carriers and are thus more often infected than human beings. They believe that rats play little, if any, part in the ætiology of human disease which is acquired by man, in the same way as rats, but more rarely, from polluted waters.

The restricted localization of spirochætal jaundice has been generally recognized, in spite of the presence of leptospiral organisms in many waters and in the bodies of rats in districts where the disease has not occurred. Epidemics have invariably been associated with wet and badly-drained broken ground, as instanced by outbreaks among workers in rice fields and wet mines. During the war epidemics among soldiers were localized more or less to wet, ill-drained trenches. Stokes found that six out of fifteen rats caught in the areas in Flanders in which jaundice was epidemic contained in their kidneys a spirochæte capable of producing the disease in the guinea-pig. The disease has also occurred among workers in sewers. It is possible that rats inhabiting wet mines originally become infected by feeding on slime in old disused tunnels blocked up with loose stones, as seen in the mines visited by Buchanan. Rats far distant from infected mines in East Lothian were also found to be infected with the leptospira, but no cases of jaundice have been reported in the particular areas. Foulerton, Balfour and Stevenson have reported the presence of pathogenic leptospiræ in rats from different counties in England where the disease was unknown. Coles, at Bournemouth, also noted the existence of infected rats there. These findings suggest that the leptospira is more ubiquitous in soil than is at present suspected. It may be also that rats can acquire infection from

water-attenuated leptospiræ which by passage become pathogenic to man in certain circumstances.

The reaction of the soil and water from various coal mines and reservoirs in Scotland was ascertained by Buchanan, and it was found that no leptospiræ were present in distinctly acid environments. Toyama also stated that naturally acid soil was inimical to the existence of the organism. Ido, Hoki, Ito and Wani, in 1917, found that the soil and water had an alkaline reaction in those coal mines where eighty to a hundred cases of spirochætal jaundice occurred annually, and that in mines where few or no cases occurred the soil was acid.

Buchanan's experiments to determine the possible modes of infection confirmed the work of other investigators, except that his feeding experiments with guinea-pigs gave negative results. He obtained positive results by infection through the nasal mucosa, through the eye, through the abraded skin, and also through the shaved unabraded skin.

In 1917, Dr. Stanley Griffith prepared an antispirochætal serum from horses immunized with the Belgian strain of spirochæte originally isolated by Captain Adrian Stokes. Seven years later Buchanan found that this serum protected guinea-pigs from infection and exerted marked spirochæticidal and spirochætolytic action on both human and rat strains of the spirochæte. At the request of the Medical Research Council, Dr. O'Brien, of the Wellcome Physiological Research Laboratories, prepared a potent horse antiserum from the Scottish strain of spirochætes, but the number of human cases in which it was tried was too few to provide evidence regarding its efficiency.

For the prophylaxis of spirochætal jaundice active immunization by injection of a vaccine of the spirochæte was experimentally proved by the Japanese, and prophylactic injections of vaccine were employed on a large scale in Japan with successful results. Toyama, in 1924, advocated the use of calcium cyanamide in agricultural regions where the disease was endemic, and where it was applied to the soil no further cases of the disease were reported. Lime nitrogen has also been used with striking results.

Inada stated that by improvement of the drainage in wet mines the number of cases among coal-miners in Japan decreased.

As regards water supplies, Houston found leptospiræ present in filtered water as well as in the raw sources of supply. Leptospiræ can pass through Berkefeld candles and are not held back by sand filters. But until it is possible to distinguish between the pathogenic and saprophytic leptospiræ with some degree of certainty, he thinks the greatest caution should be exercised in forming conclusions from the mere presence of leptospiral forms in a water. He considers that in view of the recent experiences it is very desirable to avoid dead-ends in a water system and to take the water for drinking purposes direct from the main, to have cisterns kept clean, covered, and inaccessible to rat pollution.

Fortunately, chlorination of a water-supply easily destroys leptospiræ, and the amounts necessary are usually less than those employed in the Army, 0·3 part per million being commonly effective in a well-clarified water.

Extermination of rats as far as possible, both in coal mines and generally, constitutes an important preventive measure. The rat may cause wholesale spread of leptospiræ, which with our present knowledge must be regarded as possibly pathogenic to man. The problem of how the rat acquires the infection remains to be solved. Buchanan's researches rather suggest that water and slime may be the means of conveying the disease to human beings, independently of rats. Uhlenhuth and Grossman hold similar views. Further research is obviously required to settle these important points.



## Clinical and other Notes.

### ARSENICAL DERMATITIS TREATED WITH SODIUM-THIOSULPHATE.

By MAJOR W. BIRD, M.C.  
*Royal Army Medical Corps.*

#### CASE I.

*Previous History.*—The patient, a man, aged 37, had suffered almost continuously for two months from “diarrhœa,” which had developed in the autumn of 1924 during a stay in the hills. He had been kept under observation since the onset of the diarrhœa, which had failed to yield completely to various forms of treatment, including purgatives and a course of emetine hydrochloride, one grain hypodermically for ten days.

*History of Present Condition.*—When this case was first seen by me he was confined to bed for a short period, and given a low diet and saline treatment, and this resulted in a definite improvement. On December 6, a few days after his return to duty, the patient had a relapse, which came on after some rather vigorous exercise. Blood and mucus appeared in the stools, and these were found on examination to contain the vegetative forms of *Entamœba histolytica*.

*Treatment.*—On December 14 it was decided to try whether or not stovarsol in daily doses of eight grains by the mouth for ten days would be of any benefit. His diet for the first six days of this course was beef-tea, arrowroot, sago, puddings, cocoa, tea and toast. On the seventh day he was given a light diet, but “felt off colour,” and he began to have burning pain in the stomach, and in the evening he complained of headache and continuance of abdominal pain.

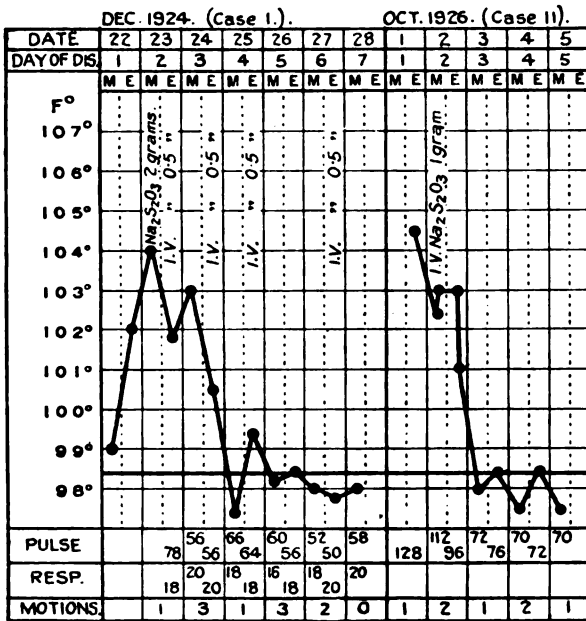
On December 22 his temperature was 99° F., and rose to 102° F. later in the day. Repeated blood-examinations revealed no malarial parasites. The bowels were confined in spite of the large doses of magnesium sulphate which had been given.

On the morning of December 23 he took his daily dose of eight grains of stovarsol at 8 a.m., and about two hours later a profuse rash appeared all over the body. This rash was a rosy erythema with mottling. It was generalized over the whole body, but more intensely marked over the trunk, and disappeared on local pressure. The rash corresponded to the description of arsenical dermatitis recorded by other workers. The urine contained a thick suspension of uric acid and urates, but no albumin.

At 3 p.m. on the same day his symptoms became urgent. His tempera-

ture was found to be 104° F., his pulse very feeble, and he showed severe dyspnoea and complained of a feeling of impending death. Movement of the bowels, produced by magnesium sulphate, given as soon as the rash was first observed, caused an immediate relief of the distressing symptoms. He was given two grammes of chemically pure sodium-thio-sulphate in solution by the mouth, and about two and a half hours later his temperature had fallen to 101·8° F. (*vide* temperature chart).

At 6 p.m. he was given 0·5 gramme of sodium-thiosulphate intra-venously. Similar injections were repeated at 6 p.m. on December 24, 25 and 27, and the patient was firmly convinced that they afforded him almost immediate relief.



After the first intravenous injection of sodium-thiosulphate the patient began to improve, and the rise of temperature was controlled (*vide* chart).

*Progress.*—The next day branny desquamation commenced on the face, ears and feet. The hair of the head was brittle and fell out in quantities.

On the following day the rash was extending on to the upper extremities, but was fading on the thighs and becoming less prominent on the back. The rash continued to fade during the next two days, and peeling of the skin of the hands and feet was noticeable.

By December 29 the rash had completely disappeared, having lasted six days, but branny desquamation continued for some days.

Fourteen consecutive daily microscopical examinations of the stools

were then made, and all proved to be negative to vegetative forms of amœbæ or their cysts.

The "anchovy sauce" character of the stools was lost, but some mucus was still passed. Daily rectal injections of normal saline solution improved the latter condition.

The slow pulse rate noted in the temperature chart was probably accounted for wholly, or in part, by the fact that under normal conditions this patient had a low rate, rather than by any effect of the arsenic.

#### CASE II.

Signaller W., aged 23, a case of chronic benign tertian malaria, relapsed on September 22, 1926. After receiving three grains of calomel on the evening of September 22, followed next morning by 60 grains of magnesium sulphate, he was given three four-grain pills of quinine-stovarsol at 10 a.m. and three pills at 3.30 p.m. daily. Each four-grained pill contained 2.008 grains of quinine and 1.6 grains of stovarsol, so that the daily dose of quinine was 12.048 grains, and of stovarsol 9.6 grains.

Three ounces of sugar mixture, containing one and three-quarter ounces of sugar, and fifteen grains of sodium bicarbonate, flavoured with three drachms of lime juice, as recommended by Harrison (1926), were given with each dose of three pills to protect the liver cells, together with sixty grains of magnesium sulphate to promote free elimination of the arsenic by the bowel.

The quinine and stovarsol produced the usual rigor on the first day at 4.20 p.m., the temperature rising to 103.2° F. The patient's temperature was normal the next morning, September 24, and thereafter remained normal till the evening of October 1, the ninth day of treatment with quinine and stovarsol pills. At 7.15 p.m. on October 1 he came to hospital with a temperature of 104° F. and pulse 128 per minute. No malaria parasites could be found in his blood by the thick-drop method on that evening, nor on the following morning. He was given his usual three pills of quinine and stovarsol at 10 on the morning of October 2, making a total of fifty-seven pills since the commencement of treatment. The patient had thus received a total of 114.456 grains of quinine and 91.2 grains of stovarsol.

On the morning of October 2 a rash appeared, consisting of a very faint rosy mottling on the lower part of the back, over the lower part of the chest wall in the axillary and mammary line, and over the sternum and epigastrium. There was no sign of rash on any other part of the body. The urine contained no albumin or crystals, and there was no deposit on standing.

The quinine and stovarsol treatment was stopped, and he was given one gramme of sodium thiosulphate intravenously at 11 a.m. The temperature remained at 103° F. until 6 p.m., but at 9.30 p.m. it had fallen to 101° F., with a relief of the symptoms of headache and general malaise. By

7 a.m. on the next morning the temperature was normal and thereafter remained normal. There was a slight increase in intensity of the rash of October 3, but the distribution was the same as on the previous day.

On October 4 there was a fine branny desquamation of the skin over the area of distribution of the rash. On the 5th this branny desquamation was less marked, and the rash had begun to fade. On the 6th very little desquamation or rash remained, and on the 7th both had entirely disappeared.

The temperature chart shows the striking effect on the temperature of the intravenous injection of one gramme of sodium-thiosulphate, in spite of the fact that three pills of quinine-stovarsol had been given one hour before.

After an interval of six days the quinine-stovarsol pills were again administered. Three pills were given on the first day, September 9, six on September 10 and subsequent days, and three on September 31, with the usual dose of magnesium sulphate and sugar. On September 9 he received 1.5 gramme of chemically pure sodium thiosulphate by the mouth, as recommended by Myers, Marples, Groehl, and Throne (1926). This, however, was followed by severe colic, so the drug was not repeated till the morning of September 11, when 8.5 grains of sodium thiosulphate were given in three ounces of water, producing abdominal pains from 10.30 a.m. to 3.30 p.m. The dose of sodium thiosulphate tolerated without undue colic was found in this case to be 5.6 grains, and this was given every alternate morning up to the end of treatment on October 31.

The patient thus received, during this second course, a total of 132 pills containing 265.056 grains of quinine and 211.2 grains of stovarsol. As this is rather more than double the amounts which originally produced the arsenical dermatitis, and symptoms of arsenical poisoning, it may be concluded that sodium thiosulphate prevented their recurrence.

Daily examination during this second course revealed no further sign of any rash; there was no further rise of temperature, and no symptoms of malaise.

#### COMMENTS.

(1) *Reasons for Stovarsol Treatment.*—Stovarsol was given in Case I, because emetine had definitely failed to cure the condition, vegetative amœbæ being passed in the stools.

(2) *Effect of Stovarsol.*—In Case I, oral stovarsol apparently cured the amœbiasis, but in both cases its gradual cumulative effect produced an arsenical dermatitis. This may have been due to deficient elimination of arsenic by the kidneys and bowel, and therefore an attempt of the body to excrete arsenic by the skin producing the dermatitis, or to some unexplained susceptibility or idiosyncrasy towards the drug. Ten cases of chronic benign tertian malaria treated about the same time as Case II, but who were treated continuously for twenty-eight days with quinine-



stovarsol in the same daily amounts, experienced no ill-effects whatever from the treatment.

Johns and Jamison (1925) state that the only untoward effect attributed to stovarsol was dull headache in one case, mild rash in another, and rash with slight temperature in a third.

Willmore (1926), however, says that at least one death from this drug has been heard of. He records one case under treatment that developed intense dermatitis with purpuric spots after only eight grains of stovarsol.

Vialatte (1926) describes a case of benign tertian malaria which he treated with two courses of sodium stovarsol as follows: 4.5 grammes were given intravenously in four days, from January 22 to 25, 1926. After an interval of five days, the administration of 1.5 gramme on the morning of January 31 was followed in the afternoon by severe rigor, vomiting, and later sweating, and a rise of temperature to  $40.3^{\circ}$  C. ( $104.54^{\circ}$  F.) in the evening. The blood was found to be negative to malaria parasites by the thick-drop method. One gramme given on February 1 was followed on February 2 by a morbilliform papulous eruption all over the body. It was more marked over the sternum, on the back, on the outer aspect of the arms, and on the front of the thighs. On the face the eruption was confluent and of a deep red colour, and the case was suspected to be one of scarlet fever. The stovarsol was accordingly stopped, but the erythema increased in intensity on February 3, and thereafter gradually faded during subsequent days.

On February 7 one gramme of sodium-stovarsol was administered intravenously, and on the next day the erythema broke out again, became more red and intense than in the previous attack, and took on the form of diffuse erythematous patches. Stovarsol was stopped and replaced by quinine, when the erythema gradually disappeared.

Duperie and Cadenaule (1926) report a case in a child, aged  $5\frac{1}{2}$ , to whom 3.75 grammes of stovarsol were administered in March, 1926. During the course of this treatment a morbilliform eruption appeared simulating measles. In May, 1926, 4.75 grammes of stovarsol were administered, but there is no mention of any further rash.

(3) *The effect of the sodium-thiosulphate* was to produce an immediate and rapid improvement in the signs and symptoms. It had a marked tendency to reduce and control the temperature, which tended to rise again next morning when its effects had worn off.

Chen (1926) treated three cases of arspenamine dermatitis with intravenous injections of sodium-thiosulphate in doses of from 0.3 to 0.6 gramme, repeated at daily intervals until improvement occurred. In each case there was rapid improvement in the signs and symptoms.

Myers, Marples, Groehl, and Throne (1926) advise a dose of one gramme of fresh crystals of sodium-thiosulphate three times daily before meals for adults, and the ingestion of large volumes of fluid. In order to secure the best results the daily intravenous administration of 0.5 gramme of sodium-

thiosulphate is advisable. They state that the only contra-indication to the use of the drug is intestinal irritation. There are no evidences of disturbance of kidney function, but there is diuresis. The same authors state that Nyiri has shown that when sodium-thiosulphate is introduced into the blood-stream sixty to seventy per cent of it is oxidized to sodium sulphate, while the remaining thirty to forty per cent remains unchanged in the urine, provided there is a normal kidney function. They explained the mode of action of sodium-thiosulphate as follows: The continued use of fresh crystals of this drug releases the arsenic that has been deposited either in the skin, or along the nerve trunks until a gradual return of normal conditions is observed.

I have to thank Lieutenant-Colonel W. S. Nealer, I.M.S., Officer Commanding No. 7, Indian General Hospital, Dera Ismail Khan, for permission to publish the first of these two cases.

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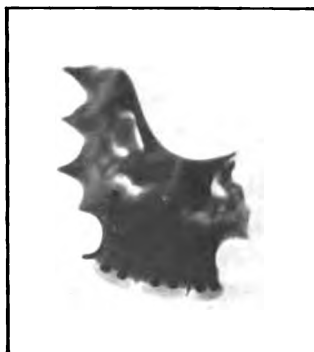
## NOTES ON A CASE OF SWALLOWED DENTURE.

BY MAJOR C. W. BOWLE.  
*Royal Army Medical Corps.*

BANDSMAN B., 1st Battalion the Border Regiment, was admitted to York Military Hospital, about 6.30 a.m., on November 22, 1926, stating that he had swallowed his upper denture whilst laughing in the barrack-room.

He was ordered to bed by the O.M.O., and attempts to tickle the fauces and produce the denture by regurgitation failed to effect the desired result.

On arrival at hospital I found the man in great pain across the chest. A skiagram located the denture lying in the œsophagus about an inch below the sterno-clavicular articulation—the vulcanite with serrated edge and the attachment, wire-angulated and dangerous-looking, produced a formidable picture.



*Per oram* the denture could not be seen, and the idea of retrieving it by a coin catcher was considered too dangerous to attempt, for fear of damaging the œsophagus and the adjacent aorta.

Steps were taken to procure his urgent admission to Millbank for treatment with the œsophagoscope by the throat specialist.

In the meanwhile the patient was encouraged to eat partly-cooked stringy cabbage with a view to surrounding the dangerous edges and wire of the denture with an enveloping material, and so to produce an innocuous bolus for passage into the stomach.

The estimated size of the denture was about 2 inches by  $1\frac{1}{2}$  inches.

Radiograms were taken at regular intervals, but the plate remained fixed in the œsophagus in the same position.

However, whilst awaiting transport, and shortly after 2 p.m., the hospital radiographer reported to me that the denture had left the œsophagus and was located in the fundus of the stomach.

It was decided in consultation to perform a gastrotomy at once and so deliver the denture.

This was done without delay, and the denture was found to measure  $1\frac{1}{2}$  inches by  $1\frac{1}{2}$  inches.

It is a question whether the denture would have passed through the pyloric and ileo-cæcal valves *per vias naturales* without untoward results.

The patient has done well.

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## Travel.

### L'OISEAU ROUGE.

By U. P. A.

(Continued from p. 142.)

### III.—RAJPUTANA.

It is instructive to study and compare the failings of other people—always provided you remember that you need an occasional coat of whitewash yourself.

Look at the Bengali, a splendid theorist but, when it comes to practical politics, an utter failure. He will weep, squeal, wriggle and throw bombs rather than face actual facts.

Compare him with the Gaul: the logician who has never heard of "the human element," and who thinks you are mad or hypocritical if you suggest such a thing.

Then there is the Pathan, a thief and murderer pure and simple. But does he think so? Not at all. He has been brought up to brigandage and killing; they are part of his normal life, just as filling up army forms and golf are part of yours.

He is quite different from the Punjabi, whose failing is a tendency to run heavily into debt and to remain in that deplorable state.

And so when we encounter the Rajput we conclude that India is like a badly-dispensed emulsion ; its ingredients do not mix.

In the days of long ago the Rajput was noted for his chivalry and personal bravery. His women were free, and they were famed for their beauty and courage. The Rajput knights and ladies were worthy to march with Bayard, the Bruce, or Jeanne d'Arc. Rajput pageantry is fit to grace History's finest page.

But what of the present? Alas! the heavy-lidded, slow-witted, indolent, dreamy Afeem now stalks the land.

When the Gods of his fathers are good the Rajput bedecks himself and keeps high-holiday. Hearts are light; the dust haze may soften, but it cannot dim, the brilliant and variegated colourings.

Perhaps at such times the Rajput remembers his long line of illustrious ancestors.

But a time comes when the crops are thin, and the cow dies, and the camels fall sick, and the tax collector's shadow falls across the threshold. Then it is that Ganpat Rai takes to his bed of string and invokes the aid of the god who is greater than all the other gods put together—Afeem. He gazes through the dust into the coppery sunset of a spent day, and there he sees the like of which has not been dreamed of even in Los Angeles.

Opium restores his peace of mind ; but it has a disastrous effect on his purse and will power.

To a doctor the most interesting example of light and shade in Rajputana will be found in the contrast between splendour and squalor.

Splendour and squalor thrive side by side and in a far greater degree—or, at least, are far more noticeable—than in British India.

The Court is magnificent, progressive and accessible.

Sanitation is primitive, backward and fortuitous.

A comparison of the regal and sanitary budgets would be illuminating and, let us hope—but not too optimistically—salutary. Perhaps I am wrong ; perhaps sanitation is budgeted for in a handsome way ; governing bodies don't always get their money's worth in Hindustan.

No matter what the explanation may be the fact remains that, in the matter of sanitation, there is a crying need for a little more *in arduis fidelis*.

Cleanliness, as well as gallantry and grit, form part of the traditions and training of our regiments recruited from Rajputana, and this must have a good effect when the discharged sepoy leave us to return to their own homeland. It would be a good thing if the Rajput Prime Ministers and Secretaries of State for Public Health were to serve a probationary period in the ranks of these regiments prior to taking up office. A couple of years as sanitary havildar would work wonders.

In the olden days—before Afeem ruled the land—when the heavens

descended and the rivers rose, no doubt the Rajputs built bands to keep the waters in check or to divert them into the fields of their enemies; no doubt the damage done to their own country was repaired as fast as the floods receded.

But nowadays . . . .

About five months before we set out on our travels certain parts of India had been devastated by floods. Rajputana and the U.P. had suffered heavily and, as a result, our excursions in both of these areas did not proceed according to plan.

As soon as L'Oiseau Rouge crossed the border we found the roads to be in an execrable state; and the further we went the worse did they become.

The car was well sprung, but was not fitted with balloon tyres or shock absorbers, and so pace had to be much reduced. Still we persevered; and it was not until we found that whole sections of the Bharatpur-Jaipur road had been entirely washed away, that we gave up motoring as an enjoyable, or even possible, pastime.

The thirty nasty miles into Bharatpur City sealed the fate of the baggage mountain. At the first opportunity we overhauled it, weeded out gear which weighed a good 140 pounds, and sent it back by train.

It shows what a lot of "essentials" one can do without, for we never felt the loss of a single article! L'Oiseau Rouge took on a new lease of life and became quite young and lively again. The Hop gave thanks to Allah for relief from an undue amount of coolie work; on- and off-loading never did appeal to him much.

Throughout the trip we never made any arrangements in advance, and we were never let down. True we had a few narrow shaves, e.g., at Delhi, on account of the hunch from U.S.A., and at Muttra and Jullundur, as will be told later on. At first we thought that Bharatpur would be our undoing, but, as events proved, we were quite mistaken.

The Maharajah maintains a fine guest house. It was full to overflowing with his relations and friends assembled for the Holi.

"Hotel?" "No hotel"; so we went off to a humble flood-scarred dāk bungalow which stands in a dreary compound facing the railway station. Georgina hesitated: The Hop sniffed; but it was this or nothing. We very soon found that the look of the place was its one and only defect; if ever you go there see our entry in the Visitors' Book.

And now let it be published abroad that Bharatpur is the spiritual home of Indian hospitality and courtesy.

As hospitable as Lancashire and as courteous as Cromarty.

Captain Cursetji, one of the Maharajah's A.D.C.'s, and son of a worthy resident of Jullundur, did not know us from Adam. Why, then, did he act as our protector, mentor and friend?

Why—because we were strangers to the soil of Bharatpur of course!

Allah Din, the Khansamah of the d.b., knew we were not of the

Faithful. Why, then, did he strive with might and main to make us as happy and comfortable as possible?

Backsheesh? No: I don't believe it; but just because it's the way of Bharatpur.

We thank them all for their simple and unobtrusive kindness. May their several Gods ever avert the Evil Eye, and may their wives present them with many children of the male sex!

A council of war with Captain Cursetji and Allah Din determined us to leave for Jaipur that night.

L'Oiseau Rouge was safely tucked away: Khansamahji gave us an excellent dinner. Captain C. instructed the station master to treat us as Lat Sahibs and, at 11.30 p.m., we boarded the "Express Mail."

This conveyance was advertised to cover the sixty miles in four and a half hours. After stopping thirty-seven times, and threatening to stop 337 times en route, we arrived at Jaipur at 5 a.m. on the fifteenth day of the tour.

Extract from the *Indian Gazetteer* :—

"*Jaipur*.—Jaipur is surrounded by rugged hills surmounted by forts. At the end of the ridge is the Nahargarh or Tiger Fort. A masonry crenellated wall, twenty feet high and nine feet thick, surrounds the city. In the wall are seven gateways with kiosks above and machicoulis over the entrance, and at intervals are bastions and towers pierced for cannon, while the parapet is loopholed for musketry. North of the Maharajah's Palace is the Tal Katara tank, about 100 acres in area and stocked with crocodiles."

We hired a one-horse shay and saw all these, with the exception of the crocodiles. As regards the machicoulis, Georgina swore she saw them, but I am sceptical, and The Hop says *he* never saw them. We also inspected :—

(a) The menagerie :—

- (i) Domestic, i.e., flies; millions and millions of them. Two-thirds in the bazars and the remaining third in the hotel dining-room. The other hotels must have been clear of flies; there could not possibly have been enough to go round.
- (ii) Wild, and yet tame, viz., thousands of peacocks and thousands of black-faced, grey-whiskered, monkeys. It was a remarkable sight on the outskirts of the city, for these birds and animals literally swarmed. They must do an enormous amount of damage to gardens and crops.
- (iii) Utilitarian. Camels and cows. The former crowd the roadways and the latter occupy the pavements. Small portions of pavement not occupied by cows are filled by babies.
- (iv) Regal. Horses and elephants. On State occasions the horses are harnessed to the royal carriages. For a description of the harness and carriages, read "*Cinderella*." The elephants are

employed in royal processions and for shikar. There must be dozens and dozens of them ; but as we only remained in the elephant stables for about half an hour, we were not able to count more than a fraction of the total number. I'm not certain about the machicoulis, but crocodiles, peacocks, monkeys, elephants and cows are sacred and enjoy complete immunity from molestation. As a result they flourish and multiply exceedingly. However, a check has to be kept on the elephants on account of the enormous cost of their upkeep ; and there is little doubt but that this profane interference has roused the ire of the Gods. In no other way can one satisfactorily account for the plague of flies.

(b) The Albert Museum.—We hate museums, but this is a good one. It was founded, stocked and arranged by a former Residency Surgeon in the days when the exigencies of the Service did not compel a move on an average once every nine months. It is a fitting tribute to this one man's perseverance, industry and good taste. Here may be found, admirably displayed, examples of all India's arts and crafts ; a most complete and artistic collection. In the main hall there is an interesting series of portraits of the Maharajah and his forebears. The museum is housed in a splendid building which stands in the grounds of a well-kept public park.

(c) The Observatory, founded by Sawai Jai Singh. It is the weirdest collection of masonry imaginable, and would be an excellent still-life studio for advanced Cubists. Was Sawai Jai Singh the ancestor of all Cubists ? Probably he was ; there is nothing new in this old world.

By this time the one-horse shay had lost most of its pep, so we returned to the Hotel Musca Domestica for tiffin.

What a tiffin—ugh !

The Hop then chartered the earliest known motor-car in India. Sawai Jai Singh imported it for running out to his country house ; that is, to get as far away from his observatory as possible.

However, 200 or 300 years make a difference even to the best of cars.

We heard the S.J.S. coming long before we saw it.

It arrived with its radiator spraying like a really good watering-cart.

Within ten minutes the jets of water became jets of steam, but the thing never actually burst : at least, not all at once.

The S.J.S. could only move on second gear. The row was terrific ; like a jazz band playing in a kerosene-tin factory.

The hotel bearer, khidmutgar, masalchi, mali and sweeper pushed the S.J.S. for a couple of hundred yards along the road ; then the ignition functioned and we shot off.

Half-way up the first hill the S.J.S. stopped. After that The Hop became quite expert in nipping out when we slowed down, and placing bricks behind the rear wheels before the S.J.S. started to run backwards.

Downhill we sat pale and tense, and prayed. Peacocks screeched,



monkeys chattered, camels grunted and people cursed, and yet, *mirabile dictu*, the S.J.S. held together for four horrible, nerve-racking hours.

There are heroes everywhere, and they are not uncommon even in the humblest walks of life.

Of all the heroes I've ever met I give the palm to the owner-driver of the S.J.S. At the end of the run he was perspiring, certainly, but he was also smiling and optimistic; and although we had covered three hundred miles he only charged us for thirty, at ten annas per mile.

The objective was Amber, the old capital of Jaipur.

"But," says Georgina, "don't you think we have had enough of dead cities and cemeteries by now?"

"Yes, I dare say; but it's impossible to omit Amber."

The road, flanked by bare, jagged hills, ascends to a rugged pass. Immediately the crest is reached a wonderful sight meets your eyes and unfolds in wonder heaped on wonder as you descend.

The hills are precipitous and forbidding: grey-black in colour, but enlivened here and there by patches of dull red and by the green of shrubs and trees.

On the left, away below, is a narrow valley containing big masonry tanks, gardens, ornate bridges and roofed esplanades.

On the other side of the valley rises a very steep hillside, on the face of which is built the palace of Amber, coloured yellow-ochre and grey, beautifully proportioned and, in design, quite unlike the Moghul type of architecture. You may see it in Arthur Rackham's compositions.

At the foot of the valley lies the deserted city, full of Hindu carving and modelling, always uncanny, often gruesome.

The whole area, many acres in extent, is surrounded by a high wall with defensive towers and bastions. How they have clung to the precipices and ridges for so long is nothing short of marvellous.

Amber is crowded with thousands of lost souls. They have nothing better than rats, bats, owls and spiders in which to re-incarnate, so they are thoroughly discontented. I did not like their whisperings, and I noticed Georgina glancing over her shoulder in an agitated manner several times. In a narrow street a snake crossed our path. The Hop said—"Wah-wah, Allah y Akbar!" and sought the support and company of his co-religionist, the hero of the S.J.S.

We returned to a fly-spangled dinner and discussed matters of moment.

The original plan, and inclination, urged us on to Ajmere and Udaipur; but Nature—and especially Georgina's nature—rebelled against the ever-increasing heat (it was stoking-up in earnest by now), the dust and the flies.

Secondly, the "Express Mail" was a poor substitute for L'Oiseau Rouge.

Thirdly, The Hop remarked tentatively, "Kashmir men baraf hai."

Georgina drew a deep breath of nasty hot air and said—"Kal fajar Kashmir ki taraf hum jane-wala hoge."

That night I dreamed of ice and edelweiss.

The morning of the sixteenth day was spent in the brass-workers' bazar.

The usual stock-in-trade was displayed at exorbitant prices.

At the end of half-an-hour's hard talking some things worth looking at were fished out of dusty corners. At the end of another half-hour some really fine pieces were produced and offered at reasonable rates.

You cannot hurry the East.

At 11.20 a.m. we boarded the "Express Mail."

Once clear of Jaipur's hills the journey was uninteresting. The route lay through scrub-covered deserts, and a dust storm kept us company most of the way.

Arrived Bharatpur 5.30 p.m. and received a cheery welcome from Allah Din, who had been spending his leisure cleaning L'Oiseau Rouge.

After tea we drove round the "cantonment" part of the capital, called on the Maharajah's, the Resident's and the Residency Surgeon's Not-at-Home boxes, and saw the damage done by the floods.

Whole chunks of roadway had vanished.

There was a tall tree on a branch of which a young Rajput first saw the light of day. The branch was about twenty-five feet from ground level and, when the infant was born, about three feet above flood-level.

At this time the Maharajah himself navigated a small launch into, and all over, the rooms on the ground-floor of his palace. He was nearly wrecked on a marble-topped table in the drawing-room.

By the way, His Highness is a motor engineer. Not merely an amateur who knows the difference between the clutch and the differential, but a skilled, trained engineer.

However, that is but one of His Highness's numerous accomplishments: he is what the Americans call "a real live wire"; not a pleasant term perhaps, but it signifies a good deal.

On our return to the d.b. we found that Captain Cursetji had called, bringing an invitation to attend the Maharajah's Holi Durbar.

Georgina spent the rest of the evening wondering what she could wear, as she hadn't "a rag fit to be seen in." You know. Allah Din spared her a sleepless night with the comforting news that, at that moment, she was the one and only memsahib in the place. That cost me a rupee, but it was worth it.

We spent the seventeenth day at Dig.

To enter the Dig road we had to traverse the "native" part of the city.

The Holi was in full swing and, as nearly all the inhabitants are Hindus, the scene was exciting, if not very edifying. At this time a good deal of potent country spirit and various indigenous stimulants and narcotics are consumed.

The bazars were crowded with hundreds of more or less inebriated people who drenched each other with gallons of magenta-coloured water,

and scattered pounds of magenta-coloured powder over each others' heads and clothing.

Pitched battles of magenta were being fought at every street corner, and in the lanes sharp-shooting, skirmishes and ambushades were everywhere in progress.

We were extraordinarily lucky in escaping untouched.

Allah Din was with us, and it was amusing to watch the ill-concealed looks of disapproval and disgust which passed between him and The Hop. The sahib may do some crazy things at his annual festivals, but at least he doesn't paint the place magenta nor outrage the feelings of the Faithful.

L'Oiseau Rouge then conveyed us for twenty-four miles through a sparsely inhabited country, the outstanding features of which were huge ant-heaps, dense thickets of tiger grass and reedy jheels; good big-game shikar ground for those who could afford to employ elephants.

Dig consists of: (a) A typical Rajput village. The bazars are narrow and tumble-down. If you meet another vehicle of any kind you must back, unless the other fellow can be induced to do so. Anyhow, you can't pass each other. Dirt is not conspicuous by its absence, but to-day it is of a magenta hue.

(b) An ancient fort. This is a black, frowning mass. Immensely solid and strong; complete with glacis, moat, keep, flanking towers, drawbridge, and all that pertained to a high-class stronghold of early mediæval times. It must have been a mighty hard nut to crack in those far-off days.

(c) The Maharajah's summer palace. An ornate building, erected on an ornate causeway which divides two big tanks or bathing-pools. The building is a good example of modern Indian workmanship, and the interior is well designed to ensure a maximum of comfort and coolness. Some of the devices used to this end are excellent. The furnishings—well, they must have cost a lot of money to import; but if the products of the Magasin de Printemps are installed in an Oriental potentate's palace something is bound to clash. The view from the windows of the palace across the tanks to the houses and temples on the other side is charming. The palace gardens are most attractive and well-kept. The combination of colour and shade is a triumph of artistic utility. The place is said to be like fairyland on big guest nights, when the fountains are playing and the palace and grounds are illuminated by thousands of multicoloured lights. Under such conditions the hot weather must be robbed of half its terrors, provided the antimalaria squad is doing its job; but that is just the point. . . .

The eighteenth day was full of incident.

Chhota haziri appeared early, and Georgina, despite her misgivings, managed to parade smart and properly dressed five minutes before the "fall-in" sounded.

At 8 a.m. Captain C. took command and we rolled off to the Durbar, L'Oiseau Rouge looking very spick and span.

The ceremonies took place in a small pavilion standing in the middle of a walled enclosure into which the assembly fitted, but only just. There must have been a good deal of preliminary rehearsal and stage management to ensure that everyone knew his right place and remained in it.

We arrived at 8.15 a.m. and were given chairs behind the Maharajah's stance.

At 8.20 a.m. a number of royal servants, dressed in scarlet and gold, dusted the floor of the pavilion, spread some gorgeous rugs and arranged a number of fat, silken cushions.

At 8.25 a.m., a party of cadets marched in and took up station behind our chairs. They were garbed something like our own Gentlemen-at-Arms.

At 8.30 a.m. an artillery salute began, and soon, between each round, we could hear the cheering of the people and the music of bands. Not the music of a band, but of bands—seven of them—all playing at once and close to each other, and each a different tune.

In a few minutes the head of the procession entered the enclosure. This was a battalion of Bharatpur I.S. Infantry with a fine brass band. The men lined the path to the pavilion, and very smart and efficient they looked.

More guns, more cheering and more music.

The Bodyguard came next. They were dressed like our own Horse Guards, plus long leopard-skin cloaks which hung from the shoulder. The horses were black and carried leopard-skin saddle-cloths. The squadron was preceded by a mounted brass band on piebald horses; drummers with silver kettle-drums on white horses. A great show.

The charger of the O.C. Bodyguard stands on his hind legs, but fails to move the B.I.S. Infantry.

Still more guns, loud cheers and brazen melody mixed.

Then came eight mounted heralds wearing the regulation black-velvet caps, and with tunics and trumpet-banners ablaze with golden heraldic designs. They sounded a prolonged fanfare, whereupon the Maharajah's carriage-and-eight, with postillions complete (perruques included) entered and drew up.

His Highness alights—an alert, slim youth, splendidly dressed in brocaded silk, a bejewelled turban, with egret plumes and a magnificent sword.

For once in the morning, but once only, the bands agree to play in unison: the Bharatpur National Anthem; melodious, but rather lengthy.

The Maharajah stands at the salute.

The charger of the O.C. Bodyguard objects to this universal concord, again stands on his hind legs and, in coming down, just misses the Maharajah by inches.

By all the rules of the game the O.C. Bodyguard ought to have had his head cut off on the spot. I regret to say that this was not done; His Highness merely smiled at the unfortunate major.

This mixture of sportsmanship with despotism is deplorable.

I mentioned to Captain C. that if it was intended to cut the man's head off later on I should like to be there, but I received neither encouragement nor invitation.

The Maharajah entered the pavilion and received his three sons, aged 5½, 4 and 3. They made deep obeisance, and were settled on cushions by an old tutor, aged about 90.

The durbar lasted for two and a half hours. During this time the three small boys sat tight; keenly alive, but good as gold. Aet. 5½ was quite conscious of his importance and responsibilities, and on the few occasions on which Aet. 3 showed any signs of restlessness, he at once exercised his crown-princely powers. The boy will be a fine disciplinarian some day.

In the way of dignity and endurance I've never seen anything to approach the conduct of these little children. Georgina said it was a case for the R.S.P.C.C., but I don't agree; I'm sure they enjoyed every minute of it.

One State coach after another appeared, discharged its freight and pulled out.

The gathering of court functionaries, officers, landed gentry and notables of all sorts, swelled rapidly and was augmented by archers, axemen, spearmen, men in mail, bearers of the royal curry-bhat and pillau, keepers of the cloth-of-gold jahrans, horse-tail switchers, squires of the ghush-khana, pages and more bandsmen, until the eye became sated and the mind reeled.

It was too much.

The Church came last, a body of grave-looking priests and acolytes: bareheaded and shaven, bedecked with marigolds and jasmine. They were led by a reed and tom-tom band in scarlet uniforms.

This completely unnerves the O.C. Bodyguard's charger. For the third time he goes up on his hind legs, scatters the tom-tommers, and shows that he doesn't care a hoot for anybody, and especially for the Church.

Result: excommunication. At the instance of an indignant Archbishop the fighting quadruped is ordered out of the arena in disgrace, but there is a twinkle in H.H.'s eye as the animal retires.

Meanwhile the Gentlemen-at-Arms stand firm and save us from death by compression.

The President of the Army Council now advanced, called out each person's name in order of precedence, and ticked them off on the nominal roll. All were present and correct and, so far as I could judge, there were no complaints.

Each man as he advanced answered his name and salaamed to the ground. Pan and coin were given and taken in token of allegiance and trust. Then a few steps backward, another profound salaam, and the next citizen came forward.

There must have been 150 to 200 presentations. The colour, richness

and variety of the costumes, the blaze of jewels and the glitter of weapons combined to form an effective and memorable picture. These men were the flower of the State; their dignified, graceful and martial bearing was beyond all praise. Many of them wore medals, orders and decorations gained in the service of the King-Emperor.

Throughout the proceedings the Archbishop recited in a loud voice long passages from holy Brahmin script. He never tired. He was blessing the Maharajah but, as nobody paid attention to him, I've no doubt he slipped in a curse or two for the benefit of the O.C. Bodyguard and his infernal charger.

This irregularity on the part of his reverence would be quite easy to carry out without fear of detection for, while he was reciting, the reeds were screeching and the tom-toms tomming till you had to shout to make yourself heard.

The object of the "music" is to keep the evil spirits at bay. The method must be eminently successful; no evil spirit could possibly face, let alone endure, the Scarlet Band.

It was a miniature 1911 Delhi Durbar, but with a closer and more intimate touch.

Time and space preclude a description of individuals, but one at least deserves a M. in D.

He was old, 75 perhaps, tall, very thin and straight as a lance.

From top to toe his dress was the last word in fit and magnificence.

Under his tightly-wound Rajput pugri was a dark face, full of intelligence, and not devoid of humour.

His beard was trimmed Rajput style, i.e., parted down the middle line of the chin, and brushed out horizontally on each side. It was not as long as some of the other beards present, but it was the most regularly horizontal and bristly specimen imaginable.

He carried a sword in a chased scabbard, and several daggers. The hilts were of ivory and gold studded with gems.

Georgina thought he must be the Elephant-Marshal-in-Chief.

I guessed him to be the Chancellor of the Exchequer.

We christened him "The Talwar Sahib."

Shortly after 10 a.m. more guns, cheers, mixed melodies, fanfares and national anthems. The procession was reformed, and we drove through the city to the People's Durbar.

This was held in the courtyard of a public building.

The Maharajah sat at an open window while his subjects, crowded into the courtyard and adjacent bazars, greeted him in a variety of affectionate ways, mostly noisy.

A big semicircle was formed and a hundred or so dancing girls were marshalled facing His Highness. Their dresses and jewellery are quite beyond my descriptive powers. They sang songs of praise and thanksgiving, and the part-singing was very well done.

But who marshalled this gay young throng ?

Who taught these lively little choristers the words and music of a hundred and one verses ?

Who instructed them in gaiety, mimicry and deportment ?

Answer : The Talwar Sahib !

There he was conducting, encouraging, cajoling ; hopping about in ecstasy, despair, enthusiasm, depression and delight. A veritable impresario. One has to look back to Tsarist Russia for a counterpart of this.

Mid-day. We bid our kindly hosts farewell and take to the road once more.

#### IV.—OFF TO THE HILLS.

Thirty-five miles from Bharatpur, and about five miles from the Rajputana border, stands Muttra, U. P.

It took us two and a half hours to do the distance. The surface of the road was like the waves of a short, choppy sea ; the sort of reliability test it is safer to avoid. Sheer good luck got us through in safety.

Muttra, on the Jumna, is a religious centre with catholic tastes.

It is a Brahmin place of pilgrimage, for Krishna was born there. It used to be a great Buddhist centre, and it was also much frequented by the Jains. The latter are schismatic Hindus, and some of their beliefs are curious ; especially that directed against the taking of life—any kind of life—in any kind of way whatever. As a result of this the scoffers say of the Jains, that “ they deny God, worship man, and cultivate vermin.”

The river's bank is very picturesque. It is lined by a continuous series of stone bathing-ghats, backed by innumerable temples and fine stone houses. Behind these rise the flat-roofed houses, tier on tier, to the higher ground on which the main part of the city is built.

On the northern eminence rises the Jamma Masjid of the Mussulmans : date 1662 ; and as if to emphasize that this is the militant religion, it will be noticed that the mosque adjoins the ruins of the ancient fort.

Georgina and I intended to stay overnight in Muttra but, as we drove through cantonments, we noticed that :—

(a) The barracks were empty and the place had a forlorn, deserted look. The troops had departed for the present strategical centre, the north-west.

(b) The dāk bungalow had fallen down. A dejected khansamah explained that this was one of the disasters caused by the floods of six months ago.

(c) Two other bungalows belonging to Government Departments were full of visitors. In any case we had no authority to make use of them. Considering the size and importance of Muttra it is disconcerting to find that there is no place in which the casual visitor can obtain board and lodging.

There was nothing for it but to make for Delhi, distant fifty-three miles.

Owing to the Holi all shops were closed, and it was only after considerable difficulty and delay that we managed to get a supply of petrol. The waiting-time was passed in glancing through a huge mail, our first in eighteen days. Eventually we got away at 4 p.m.

The road was in very good condition and well shaded by big trees in full foliage. The crops had improved in the past fortnight, and the whole countryside was covered with a thick carpet of green. Monkeys were everywhere, and we counted about a dozen herds of black buck.

It was a delightful drive; but the day had been a long and busy one and, as L'Oiseau Rouge topped the hills to the south of Delhi, we were glad to see the lights of the city beckoning through the gloom of the fast-advancing night.

We remained in Delhi for a couple of days.

Since our last sojourn there the good ship "President Cleveland" had disembarked a fresh bunch. However, the members thereof exhibited the same anti-prohibition tendencies, and wore the same kind of clothes, as those we had already seen. A wonderful people.

We went to a fashionable cinema. The audience was composed of twenty British and 200 Indians. The film was a lurid, American, "high life" production. It was *not* pleasant. I wonder what the admis thought of it all. . . .

One afternoon Georgina and I were standing beside Asoka's Pillar on the Ridge, looking towards Hindu Rao's House, where our Durbar camp was pitched.

Georgina said: "Do you remember the apricots and cream?" Fifteen years had elapsed, but certainly—I remembered the apricots and cream.

We were a mixed mess. The C.O. (now gathered to his fathers) appointed Georgina to be P.M.C. and told her—"Do as you like, my dear; there will be no trouble *provided you supply me with tinned apricots and cream every day for tiffin.*"

One day the contractor let us down; the tinned apricots and cream arrived late.

Next day I (not Georgina, mark you) was on the mat.

Of course Georgina heard of this in due course and promptly stopped all supplies of tinned apricots and cream.

Within a few days she was discharged with ignominy from the office of P.M.C., and we lived under a cloud thereafter.

There are certain disadvantages in being a married junior officer.

On the twenty-first day of the trip we set out for Ambala; a drive of 120 miles in the face of a high, dust-laden wind.

En route we met an Akali jatha marching on Nabha by order of the Shiromani Parbandhak Gurdwara Committee; the famous S.P.G.C. This



high-sounding title connotes a limited objective ; but the means taken to attain the objective know few limitations.

The jatha numbered about 200 ; from boys of 12 to old men of 70. The former were obviously having the time of their lives but the latter looked worn and weary. Quite a number of the men had "old soldier" stamped on them.

All were uniformly clad ; black pagris with a narrow, yellow band ; long, brown chaddar shirts ; haversacks, water-bottles and kirpans. And, like all Indians when they go a-walking, they carried their shoes in their hands.

The procession was headed by a richly-decorated palanquin in which was borne a copy of the Granth Sahib. The bearers and the guard were the pick of the men.

On the approach of the jatha *L'Oiseau Rouge* was pulled up. The small boys were inclined to be frivolous, if not cheeky, but the remainder passed silent and unnoticing ; a dour, sinister phalanx.

As we neared Ambala great clouds of dust rose in dense, swirling masses over cantonments. A continuous roaring sound filled the air.

"Now we're for it : a cyclone !"

The cyclone did not develop ; it was a strictly localized disturbance due to three or four aeroplanes getting off the ground. I believe that the aerodrome has since been turfed. No wonder.

To-morrow we hope to follow in Kim's footsteps ; to visit the seats of the Omnipotent Ones ; to enter Olympus.

To-morrow we shall be in Simla-Pahar.

*(To be concluded.)*



## Current Literature.

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MANOUELIAN, Y. and VIALA, J. D'où vient la virulence de la bave chez les animaux rabiques? [How does the Saliva of Rabid Animals become Infective?] *C. R. Acad. Sci.* 1926, v. 183, 1357-9.

It is certain that the virus of rabies passes along the nerves to the mouth but the method by which it actually reaches the saliva was not known. It is found now that the virus is uncommon in the salivary glands and that it is common in the numerous small nerve trunks which exist in the tongue and the buccal mucosa. A slight abrasion is sufficient to expose these nerve trunks and in this way the virus reaches the saliva. Accordingly, the amount of virus present at any given moment must vary greatly and this is suggested as the reason why, when bitten by a mad dog, some people contract the disease while others escape. The saliva is only virulent when the mucosa is broken at some point—a state of affairs which is very common in a dog's mouth.

T. W. M. CAMERON.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 5.*

KAWATANI, S. Experimental Studies on the Prevention of Hydrophobia. *Kitasato Arch. Exper. Med.* 1926, v. 7, 61-93. [43 refs.]

Statistical observations suggest that local disinfection of wounds inoculated with rabies virus is as efficient in preventing the disease as is anti-rabies inoculation. Little experimental evidence of this is available, however, and there is still much doubt as to the correct method of treating the wound. Kawatani's experiments with rabbits show that washing corneally infected wounds within 24 hours prevented the outbreak of rabies. The best solution to use was 1 : 30 solution of lime (1 : 10 lactic or glacial acetic acid was almost as good) and a large quantity of this solution is forcibly applied for a considerable time. Wounds should be freely opened and washing may be followed by anti-rabies vaccination (although this was not so successful in Kawatani's rabbits because of the very short incubation period in those animals).

T. W. M. CAMERON.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 5.*

ENGINEERING NEWS-REC. 1926, v. 97, 95-6, 1 fig. Partial Evaporation of Trade Waste eliminates Taste in Water.

The town of Escanaba is situated on an arm of Lake Michigan, about 18 miles long, by 4 miles in average width. The water supply is abstracted 2,600 feet from shore, at a depth of 65 feet. Objectionable

tastes in the water were found to be due neither to chlorine nor to algæ, and it became a problem to trace their source with a view to finding a cure. A taste index was devised on the basis of the volume to which a unit of polluted water could be diluted with tasteless water before the taste became imperceptible. With this as a measure of taste intensity, measurements were made on samples of the water, taken in winter through holes in the ice to avoid fortuitous disturbance due to wind, and results plotted on a map of the bay. By this means the trouble was traced to a wood distillation plant, and in particular to a Myers still.

"The Myers apparatus . . . separates the crude alcohol at about 91 per cent. test, and yields two grades of hardwood oil and an acetate of lime solution. The dump from this apparatus is practically continuous at a rate of 2,500 gal. per day. The heavy, oily, tarry fluid is passed through a tar settling tank in which it is diluted so that the effluent of the settling tank amounts to about 25,000 g.d. This effluent is dark brown in colour and carries a murky, tarry sediment in suspension and floating globules of light iridescent oils. It has a slightly sweet, strong tarry odour. When diluted in tasteless water in the proportion of 1 : 300,000, a creosotic taste is still perceptible."

It was found that the taste-producing constituents of the waste were very volatile, so that evaporation of about 10 per cent. of the volume of the waste reduced its taste intensity by about 96 per cent.

The source of the contamination has practically been eliminated by partial evaporation of the waste. Other methods tried, including changes in the exhausting column and lagooning of the waste for several days to get separation of the oils, proved unsatisfactory. By evaporating a volume equal to about 0.1 per cent. of the total waste effluent 92 per cent. of the taste-producing constituents are eliminated.

[The means adopted for tracing the source of the taste (due to R. L. McNAMEE of Messrs. Hoad, Decker, Shoecraft and Drury) seems particularly ingenious. Before recommending the method of treatment by partial evaporation for any special case, it would, of course, be necessary to satisfy oneself by experiment that the taste-producing constituents are sufficiently steam volatile to render the process economically possible.]

G. T. P TATHAM.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 5.*

CONLEE, G. D. The Thin Plate Orifice for the Measurement of Water. *J. Amer. Water Works Ass.* 1926, v. 16, 456-64, 3 figs.

In 1797 the Italian philosopher, J. B. VENTURI, published his observation that fluid discharged through an expanding nozzle exerts a sucking action at the smaller diameter; in other words, that the pressure on the walls of the nozzle is a minimum at the smaller diameter and increases as the diameter increases towards the outlet. In 1887 Clemens HERSCHEL

investigated the phenomenon quantitatively with pairs of conical tubes joined at the smaller ends and obtained a patent on the device which he called a "venturi tube,"—the application of VENTURI's observation to the exact measurement of rate of flow.

Some years ago the American Society of Mechanical Engineers appointed a research committee to investigate the subject of fluid meters. In 1924 the Committee issued a report dealing with part one of the subject, the primary element of the fluid meter as defined in their introduction:—

"All Fluid Meters consist of two distinct parts, each of which has a different function to perform. The first is the primary element which is

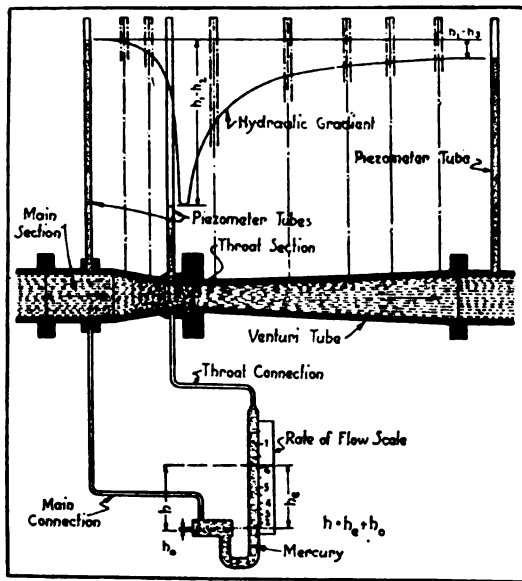


FIG 1 TYPICAL SECTION OF VENTURI TUBE

[Reproduced from *The Journal of the American Water Works Association*.]

in contact with the fluid and is acted on directly by it. The second is the element which translates the action of the fluid on the primary elements into volume, weight or rates of flow, and indicates or records the results."

Similarly the present paper deals only with the primary element. The figure of a "Typical Section of Venturi Tube" serves to illustrate VENTURI's observation and its practical application. The theoretical equation connecting the rate of discharge with the pressure difference on the walls of the tube at the throat and main sections is

$$V_t = M \sqrt{2gh}$$

where  $V_t$  is the theoretical discharge in cubic feet per sec.,  $g$  the acceleration due to gravity, and  $h$  the difference of head and  $M$  is a constant calculated for each installation depending on absolute size of entrance

section (sq. feet.) and ratio of entrance to throat diameter ; or more accurately,  $gh$  gives the pressure difference on the walls at the throat and main sections. The actual rate of flow is rather less than the above theoretical value, so that we have for the practical equation

$$V = CM \sqrt{2gh}$$

where  $C$ , the discharge coefficient, has a mean value of 0.985.

A phenomenon similar to that observed by VENTURI is produced when a thin plate with coaxial orifice is inserted in a straight run of tube through which water, steam or gas is flowing. The pressure opposite the *vena contracta*, or narrowest part of the issuing stream, is a minimum. Orifice flow meters are well known as applied to the measurement of steam ; the

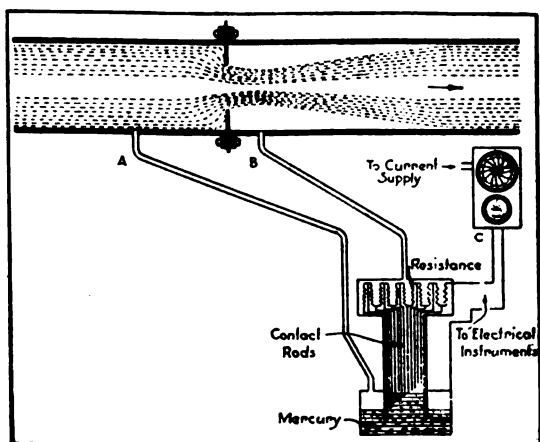


FIG. 3. ELECTRICAL MEASUREMENT OF FLOW

[Reproduced from *The Journal of the American Water Works Association*.]

application to the measurement of aqueous flow is not so familiar. Yet the orifice as applied to the measurement of water has distinct advantages which may be summed up as follows:—

1. Low first cost.
2. Ease and economy of installation, as it may be placed in an existing flange in the pipe.
3. Accuracy to compare with other types of differential medium.
4. Maintained accuracy.

The figure reproduced shows the stream lines through a thin plate orifice, and indicates how the pressure difference on the walls of the tube on the upstream side of the orifice and at the *vena contracta* may be applied to operate a variable resistance and so indicate electrically the rate of flow.

The differential pressure is balanced by mercury in a U tube. In the low-pressure side of the U tube is the variable resistance, having a number

of taps consisting of nickel rods of different lengths. The rise of the mercury makes contact with successive rods in such manner that the current flowing is proportional to the flow of water in the pipe line and the number of rods is so large that every variation of flow, practically speaking, causes an immediate change in the reading instruments.

G. T. P. TATHAM.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 5.*

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## Reviews.

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THE HOUSING OF THE NATION. By Lieutenant-Colonel F. E. Fremantle. M.P., F.R.C.P., F.R.C.S. London: Allan and Co. 1927. Pp. xiv + 193. Price 8s. 6d. net.

This is a book which marks Colonel Fremantle's incursion into the domain of political and sociological literature. It has already the distinction of having provoked a leading article and special review in the *Times* on the day of its publication; and its public interest is still further enhanced by the contribution of a brief, though important, foreword by the Minister of Health. The prominence which it has thus received is fully justified by the author's masterly analysis of the statistical, economic, material and moral factors which have made the housing problems in this country so complicated and difficult of solution. The years of the war, as is generally recognized, were lean years in house construction; overcrowding increased to an alarming extent; the reconstruction of slum areas had to be postponed, for there was no accommodation for their displaced populations; and the cost, as well as the inadequacy of labour and the high prices of building material, made it impossible, after the war, to build houses for the poorer classes at a reasonable rental without State subsidies.

Colonel Fremantle approaches his subject not only from the public health point of view, but also with the object of re-establishing happy and contented home life amongst the labouring classes, and so promoting industrial peace. All who are interested in the housing question, and it is a subject which calls for serious study by everyone who has a stake in the welfare of the country, will find in his volume abundant material to enable them to follow the history of the steps taken by successive Governments to meet the difficulties of house construction after the war; and to esteem, in its true perspective, what is being done now and what has to be done in the immediate future. As he states, in an introductory note, the book aims at outlining the right policy of prevention and cure

for evils which endanger the whole body politic. The Minister of Health, Mr. Neville Chamberlain, while warmly appreciating and welcoming it, throws some doubt on the author's calculations for estimating the needs of the future. He considers that economic, local, social and traditional factors are apt to upset the estimates with disconcerting abruptness; and prefers adhering to Carlyle's dictum, "not to see what lies dimly at a distance, but to do what lies clearly at hand," by which we understand him to mean the problem of the slums. He is convinced that there is room for interesting and valuable work in the management of small house property by tactful and sympathetic women with technical knowledge and training. Much of the trouble which in the past led to carelessness and destructiveness on the part of slum tenants, followed by deterioration and lowering of the general standard of the neighbourhood, has been due, in his opinion, to faulty management. But the real trouble is that the ownership of slum property is generally divided up to a bewildering extent, and this is the chief obstacle to proper methods of management. The problems are thus more complicated than they may at first sight appear; and their solution depends as much on private enterprise as on Government action. But, however difficult they may be, we feel confident that Colonel Fremantle's volume will go a long way towards helping both public health and political authorities to approach them with greater knowledge and with greater hope.

Let us add that the author was well-known both before and during the war to officers of the Royal Army Medical Corps; and that the publishers have provided in a cover to the volume an excellent presentment of his personality for the benefit of all other readers of his book.

**CLINICAL PHYSIOLOGY IN RELATION TO MODERN DIAGNOSIS AND TREATMENT.** By J. R. S. McDowall, D.Sc., M.B., F.R.C.P. Edin. London: Arnold and Co. 1927. Pp. viii + 124 with 4 plates. Price 21s. net.

Professor McDowall's volume is a work of supreme importance to the general practitioner and the student of medicine. It embodies a new school of thought, and one that has become more and more in evidence during recent years. Before the advent of bacteriology, with the light it threw on the ætiology of many diseases and the revolution it brought about in therapeutics, medical practice relied on microscopic and macroscopic appearances for an explanation of clinical phenomena and as an indication for diagnosis and treatment. In other respects medicine was purely empiric. We are now advancing a stage further, chiefly due to the teaching of the late Sir James Mackenzie. The clinical symptoms of disease are being studied more from a physiological than from a pathological standpoint. Pathological processes are in reality physiological or biological in their nature, although they constitute deviations from the normal functions of a healthy life. It is this aspect of disease and its clinical

manifestations that is so admirably expounded by Professor McDowall in a series of thoughtful, suggestive and withal helpful chapters. His volume, moreover, is a philosophical treatise of the first order, and is remarkably free from dogmatic teaching; for, when physiology is unable to throw light on clinical phenomena, he does not hesitate to say so. Its helpful character consists in the direction it points towards successful and rational diagnosis and treatment in the case of many ailments. It contains forty chapters, none of undue length and many of them quite short. Each can be read as a separate study, and, we venture to say, thoroughly enjoyed. Amongst the subjects with which the volume deals in connexion with physiological principles as manifested by clinical phenomena, there are chapters on life as a clinical entity, on consciousness, sensation, equilibrium, voluntary and reflex movement, speech, sight and hearing, psychology and psycho-therapeutics, on a variety of conditions involving the nervous, circulatory, respiratory and digestive systems, the excretory and endocrine balance, on the water content of the body, food, weight, growth, temperature, exercise and rest, and on skin manifestations, the whole forming a wide range of study. We would specially recommend, as an example of Professor McDowall's methods, the chapter on physiological and pharmacological principles in relation to common gastric ailments. It should prove exceptionally helpful in medical practice. But indeed every chapter merits close study, and the book will amply repay the time that may be devoted to grasping thoroughly the principles which it expounds and to assimilating the practical instruction which it provides.

There are three appendices, with detailed information regarding carbohydrate, protein and fat metabolism, hydrogen-ion concentration and the respiratory function of the blood; a bibliography, arranged according to subject, and an excellent index. Professor Halliburton, the author's predecessor in the Chair of Physiology in King's College, contributes a short introduction. As he very truly remarks, the book is not a rival, much less an imitation of other textbooks. It strikes a new note, and is a work that should be read, re-read and thought over by students of, and all engaged in the practice of medicine.

**THE HEART AND ITS DISEASES: A HANDBOOK FOR STUDENTS AND PRACTITIONERS.** By Charles D. Chapman, M.D.Dur., M.R.C.P.Lond.  
Publishers: E. and S. Livingstone. 1927. Price 8s. 6d. net.

Cardiology, in common with many branches of medical science, is at the parting of the ways. There remains a rapidly diminishing body of clinicians, who, belonging to what might be called the "præ-Mackenzie" school, still hug the traditions of the past. To them a murmur is a murmur, whatever be its time and wherever its position, and not to be treated lightly. They are dogmatic, too, in the powers they possess (or profess to possess) in their deft fingers and sensitive ears, of delimitating



accurately the size of the heart by percussion alone; with the late Sir James Mackenzie as a cherished apostle there has sprung up another school of recent years, who teach that there are murmurs—and murmurs, many of the latter, especially if systolic, in time being of little pathological significance. This school has less faith in the fingers in assessing the cardiac limits and relies on carefully standardized radiographs in doubtful cases. While not making use of the electro-cardiograph themselves, except in a few selected cases, they gratefully acknowledge and put to good account the valuable clinical lessons learned by its use.

Lastly, of course, as always, there are the “whole hoggers,” the extreme left of the Brotherhood of cardiologists, belonging to what may be called the “instrumentalist” school, to whom the electro-cardiograph and similar luxuries are as the Bread of Life and for whom it is almost a crime to let a patient go until a complete set of “leads” has been obtained.

Beware, lest you fall into the hands of one of these and are found to be suffering from “right or left branch bundle block!”

Dr. Chapman would appear to hold the scales evenly balanced between the “ancients” and “moderns.” He still relies on his fingers to percuss out a heart but does not disdain the use of modern instrumental aids.

His book, although containing many excellent things and full of good “horse-sense,” suffers from many of the defects associated with a first edition—over and over again clarity of expression is sacrificed for brevity, with the result that many of his sentences are so involved as to make their exact meaning obscure.

Several of the abbreviations used, especially those in the chapter dealing with the anatomy of the heart, would not, I think, pass a literary censor.

And now for a brief analysis of the book :—

The first chapter, dealing with the anatomy of the heart (probably because anatomy as a science strikes no sympathetic cord within me), I found too condensed for pleasant reading and many of the abbreviations “jarred.”

The second chapter, devoted to the inspection of the heart, contains much that is good. At the outset the student is exhorted to be methodical in his examination; an axiom with which we must all agree. The paragraph entitled, “Feeling the Pulse,” commences thus: “It is advisable to distract the patient’s mind while taking the pulse and to repeat the investigation at the end of the general examination after the patient has settled down.”

Those engaged in the examination of recruits should bear these few words in mind, many a promising candidate having been rejected through their non-observance.

To his list of causes of slow pulse the author could, with advantage, have added typhoid fever and influenza.

In discussing the prognostic significance of murmurs the writer follows the modern teaching of not attaching too much importance to an uncom-

plicated systolic murmur. He states: "In children a systolic murmur at the apex when not associated with enlargement of the heart nor with a history of the usual causes of heart disease should, provisionally at any rate, be considered as non-organic." With this dictum I am in complete agreement. It applies with equal force to the recruit and young soldier, and it appears a very moot point whether a recruit of healthy appearance and with an otherwise normal heart should be rejected on account of an uncomplicated systolic murmur, be it basal or apical. It must be remembered, however, that in his case an accurate and truthful medical history is for obvious reasons but rarely obtained.

The author stresses the point that an aortic regurgitant murmur is diagnosed more by its quality than by its position of maximum intensity, which is variable.

He is a brave man who would attempt an enumeration of the causes of pain over the pericardium, and I very much doubt if Dr. Chapman's list is even approximately complete.

In his interesting chapter on "Rheumatism and Heart Disease," the writer states that "the mitral valve is affected in ninety-three per cent of cases and the aortic about twenty-three per cent." This proportion approximates, I believe, to the usual figures given by other writers in this country, but curiously enough in the military population, amongst young soldiers, the relative proportion of aortic lesions of rheumatic origin is much higher. This is possibly partly accounted for by the fact that the young soldier is attacked by the rheumatic infection during a course of strenuous training, when his systemic circulation has an unusual strain to bear. It is found, I believe, in civilian practice that aortic lesions are relatively more common in those approaching adolescence.

One is reminded that rheumatic infection of the heart can no longer be regarded as an endocarditis only but rather as a *pancarditis*, all three layers, endocardium, myocardium and pericardium being invariably attacked.

The importance of repeated examinations of the heart, more especially in children, during the three or four months following an attack of rheumatic fever is very rightly stressed.

In discussing auricular fibrillation in connexion with mitral stenosis, the author calls it "a state found in the terminal stages of heart failure," a statement which conjures up visions of impending dissolution! One knows, happily, that such is often far from being the case and that with the intelligent use of digitalis the patient may continue "fibrillating" with perfect equanimity over a number of years.

A short but interesting note is devoted to the "diphtheritic heart"; mention is made of those tragic cases in which sudden death occurs in a promising convalescent. In my limited experience I have seen two such tragically unforeseen endings.

For some extraordinary reason pulmonary stenosis has apparently been

omitted from amongst the varieties of congenital heart disease, although brief mention is made of it in a later section.

The chapter dealing with "Heart Disease in Children" contains much useful information.

Some trenchant remarks are made concerning the incomplete operation of "tonsillotomy" which is too often substituted for tonsillectomy, often with anything but gratifying results. It cannot be too strongly insisted on that the operation, if done at all, should be a complete one. "Tags" of tonsils left over from an incomplete operation only too often act as a suitable nidus for fresh or continued infection.

In discussing murmurs heard in the pulmonary area the statement is made: "A systolic murmur in this area is due to obstruction of the pulmonary valves and it is generally congenital. The murmur is sometimes met with in anæmia." Surely in ninety-nine cases out of every hundred a systolic murmur heard in the pulmonary area—the so-called area of "romance"—may be considered non-organic.

In discussing the treatment of exophthalmic goitre the author is at variance with other teachers when he says, "if auricular fibrillation is present surgical measures should be postponed until this condition has been remedied." On the other hand, Mr. T. P. Dunhill, a surgeon of great experience in the operative treatment of exophthalmic goitre, has written that in his opinion auricular fibrillation as a complication of Graves' disease is no bar, but rather an indication for operation.

Separate accounts are given of cardiac asthenia, pseudo-angina, and the irritable heart, but I am inclined to think that all three belong to the varying and elusive symptom-complex of what Sir Thomas Lewis has aptly called the "effort syndrome." Of the three terms used irritable heart best describes the condition and is, in my opinion, an improvement on our official D.A.H.

In discussion the arrhythmias the author states that "extra systoles or premature beats are common and are frequently ventricular." Surely one could go further than this and say that in the vast majority of cases they are of ventricular origin. Dr. Chapman sums up his chapter on treatment with this excellent advice, "a weak heart should not be over-strained nor a capable one under-exercised," which to my mind puts in a nutshell our indications for treatment.

The book terminates with chapters on "Marriage and Maternity in Cardiac Patients," "Instrumental Aids in Diagnosis," and "Anæsthesia in Heart Disease."

The publishers have accomplished their part of the contract well, the letterpress and illustrations being very clear and the general "get-up" excellent.

As an *aide-mémoire* for those who have not the time to consult a more complete treatise Dr. Chapman's handbook is to be recommended.

*ÆSCULAPIUS ARMAQUE.* By Major M. B. H. Ritchie, D.S.O., R.A.M.C.  
London: Bale, Sons and Danielsson. 1927. 8vo. Pp. 112. Price  
5s. net.

Readers of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, all of whom must have already become familiar with the series of articles by Major Ritchie that have appeared from time to time in the Journal on a variety of subjects dealing with war and the medical services, will welcome their publication in one volume with the above title. Much that appears in the twelve articles of the volume is open to discussion and no doubt various opinions have been formed regarding their prophetic visions of the future of the Army Medical Service. We might take, for example, the difficulties that stand in the way of the author's suggestions that officers of the R.A.M.C. should go through the course of study in the Staff College and that there should be an annual conference of the R.A.M.C. The Staff College course is intended for special training in the conduct of military operations in the field and in the preparation of the armed forces for war. This is scarcely compatible with the duties of the R.A.M.C. officer, although Major Ritchie thinks otherwise and foreshadows a time when the greater part of the military administrative services, that is to say, the duties of "Q" branch, will rest in his hands. With regard to an annual conference of the R.A.M.C., much as we would welcome it, the proposal does not seem feasible in view of the large proportion of officers who are serving overseas. Only a small number take the trouble to attend the Annual Meeting of the Corps and Benevolent Funds, both of which should attract officers interested in the welfare of the Corps and its dependants. Would a larger number be induced to attend an Annual Conference? It would be all to the good if they would. Many other points in the articles headed, "*Mars et Hygea*" and "*Sententiæ Vagæ*" offer themselves for criticism, but we can only refer our readers to the volume before us and to recommend it to those of them who are interested in viewing the future of the Royal Army Medical Corps from different angles.

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## Correspondence.

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### CHOLERA IN THE ARMY IN INDIA NEARLY FIFTY YEARS AGO.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—Having arrived in India in December, 1882, for my first tour of foreign service, I have naturally read with the keenest interest the able paper on "Cholera in the Army of India nearly Fifty Years Ago," by Major-General W. H. Ogilvie, C.B., C.M.G., K.H.P., I.M.S. In those days an annual outbreak of cholera was looked upon as almost inevitable during the monsoon season, and, unfortunately, experience taught us that the expectation was not infrequently realized. During my first five years in India, for instance, I witnessed three outbreaks of the disease amongst European troops. The cases were hardly numerous enough to merit the title of epidemics. They were, however, more than sufficient to demonstrate the unsatisfactory and unsuccessful results of even the most promising methods of treatment. Many of our cases, no doubt, recovered. As a matter of fact my notes record definitely that the mortality during the first outbreak was fifty-five per cent and during the second sixty per cent of the total cases. It was difficult to feel confident, however, that the recoveries were due to any particular line of treatment. Indeed, in view of the violent vomiting and purging, it was not easy to see how medicines given by the mouth or by enemata could have any effect on the disease. There was one point on which we were all agreed, however, namely, the vital importance of skilled nursing.

I am convinced that the statement that "cholera was viewed with terror" cannot be applied with justice to our medical officers in India even in those days, as my experience taught me that one and all faced a fell and mysterious disease with habitual courage and devotion. There was, however, much to excuse a feeling of terror amongst the lay population, such, for instance, as the sudden onset, the horrible suffering, the fatal rapidity, the appalling mortality, etc. In illustration of its rapidity I may mention one case which has left a vivid recollection. A gunner of splendid physique, and in robust health, who attended church parade at 6 a.m. on Sunday, and was laid in his grave at 6 a.m. on the following morning. Such possibilities were bound to make a deep and painful impression on the general public.

At this distance one's impressions are apt to be a little hazy, but I think I am right in saying that the theory of the "miasmatic" origin of cholera was most widely accepted in those days. The miasma was believed to be strictly limited both in site and action. If troops were moved from its

immediate neighbourhood, they were believed to be safe. This, no doubt, led to the regulations for so-called "cholera camps"; regulations which were so stringent that they left not the slightest loophole for evasion. On the occurrence of the first case the infected barrack-room was evacuated and the men occupying it were placed under canvas, generally on or near the parade ground. If a second case occurred amongst the same company, they were moved into cholera camp, which was generally situated many miles from cantonments. As, during my first tour of Indian service, I did duty in two such camps, one at Allahabad and one at Lahore, I can speak feelingly on the subject. Camp life during the monsoon was really the outside limit of discomfort. One was suddenly removed from every source of amusement, occupation, and interest, and dumped down in the midst of tropical vegetation which reeked with moisture. At more or less frequent intervals the very heavens seemed to descend in torrents of rain. Under such circumstances existence became a nightmare of misery and monotony. And yet, strange to say, in spite of all drawbacks the health of the men was astonishingly good whilst in camp. Day after day the sick reports were blank.

The treatment of our cases was, of course, purely palliative. As already stated, skilled nursing was admittedly of vital importance. Hot saline baths and hot saline compresses to the epigastrium seemed to lessen the cramps and to be distinctly beneficial. Many remedies were tried. On the whole, however, my favourite was aromatic sulphuric acid with the cinnamon and ginger very much increased, as in the following prescription:—

R	Acid. sulph. arom.	..	..	..	..	5 j
	Tinct. zingib.	..	..	..	..	5 iij
	Tinct. cinnamomi	..	..	..	..	5 iij
	Aq. chloroformi	..	..	..	ad	3 vj

3j every hour.

Special caution was necessary in regard to alcohol. Its administration *might* do good, but, on the other hand, if the patient got through the initial stage, it seemed to increase the liability to suppression of urine, the sequel which was to be dreaded above all others.

I am, etc.,

G. H. YOUNGE, F.R.C.S.I.  
Lieutenant-Colonel R.A.M.C. (R.P).

## Notices.

### EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

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The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

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# Journal of the Royal Army Medical Corps.

## Original Communications.

### NOTES ON THE ROUGH AND SMOOTH FORMS OF *BACILLUS TYPHOSUS*.

By MAJOR N. T. WHITEHEAD, M.C.  
*Royal Army Medical Corps.*

THE controversy with regard to the theories of immunity in general, and Arkwright's work on the antigenic properties of "rough" and "smooth" colonies in particular, have naturally led those interested in the making of the Army vaccines to turn a critical eye on the components of their vaccines, as viewed in the light of the work of these experimentalists and the theories they have formed therefrom.

Many readers will be quite conversant with the points at issue, but, for the benefit of those who have not had the opportunity of seeing the various articles on the subject, I shall try to enumerate very shortly the conclusions arrived at by two workers which bear particularly on the subject of vaccine antigens.

I.—Felix, working with the sera of typhoid cases, described two forms of agglutination :—

(1) Floccular agglutination.

(2) Granular agglutination.

The floccular agglutination he associated with a heat-labile antigen and its corresponding agglutinin antibody, and found it to be closely connected with the flagella of the organism.

The granular agglutination Felix associated with a heat-stable antigen

and its antibody, and this antigen was found to be related to the bodies of the organism.

Felix maintained that the granular agglutinins in the serum of a typhoid patient bore a far closer relationship to the clinical course of the disease than the ordinary floccular agglutinins, and could be used as an index of the amount of immune bodies available for the patient's protection; and, further, that an inoculated person was unprotected unless his blood showed the presence of the heat-stable antigen agglutinins, or, in other words, granular as well as floccular agglutination.

Felix himself failed to demonstrate any granular agglutination with the sera of a number of inoculated men.

Arkwright came to the same conclusions working with the same group of organisms, but along slightly different lines.

Working with a strain of *B. paratyphosus* A, which we may take as representing the typhoid group, Arkwright distinguished four different forms, namely: (a) a smooth-surfaced colony of motile bacilli; (b) a smooth-surfaced colony of non-motile bacilli; (c) a rough-surfaced colony of motile bacilli; (d) a rough-surfaced colony of non-motile bacilli.

The smooth colony of motile bacilli he regarded as the normal form of the organism, and the smooth colony of non-motile bacilli as a very closely related variant.

The rough colony of motile bacilli was a very well-marked variant, and closely allied to it was the rough colony of non-motile bacilli.

For all practical purposes I think we may be allowed to regard the organisms under discussion as having two forms, a smooth (normal) form and a rough (variant) form.

He found that he was able to confer a far stronger immunity on guinea-pigs against *B. paratyphosus* A by injection of a vaccine made of the smooth form than when the rough variant was used.

By a series of agglutination tests between the smooth form and rough variant of a certain strain of *B. paratyphosus* A and the immune sera produced by them in rabbits, he was able to suggest a hypothetical antigenic composition of these two variants.

He found:—

(1) A heat-labile antigen, common to both the smooth form and the rough variant, which he called the "H" antigen.

(2) A heat-stable antigen peculiar to the smooth form which he called the "S O" antigen.

(3) A heat-stable antigen, peculiar to the rough variant, which he called the "R O" antigen.

On the strength of this he theorized that the greater protection conferred by the smooth form must be connected with the presence of the "S O" antigen, that is, the smooth heat-stable antigen, and not with the "H" antigen, or heat-labile antigen, which is common to both.

Thus we see that Arkwright not only supports Felix's theory on this

matter, but carries it one step further by suggesting that the heat-stable antigen which causes the granular agglutination shall be of the smooth variety.

Arkwright also considers that a well-immunized person should show granular agglutinins in his serum.

Two quite definite provisos are thus suggested by these workers in connection with the production of a satisfactory vaccine :—

(1) That the vaccine must be made of the smooth form rather than of the rough variant of the required organism.

(2) That the blood of properly protected persons should agglutinate in a granular as well as in a floccular manner, thus demonstrating the presence of the theoretical heat-stable antigen agglutinin.

II.—When the first proviso was applied to the ingredients of the Army T.A.B. vaccine, it was not possible to say at once whether all the forms employed were smooth.

The forms of *B. paratyphosus* A and B were undoubtedly of the smooth variety, but the typhoid strain—Rawlins—had certainly a somewhat rough appearance.

Arkwright has four tests for determining whether a colony is rough or not, which are as follows :—

(1) The colony should have a rough, opaque surface with irregular edges.

(2) It should deposit in broth.

(3) It should auto-agglutinate.

(4) When emulsified and boiled it should give a granular agglutination with a serum produced by a rough variant, but no agglutination with a serum produced by a smooth form ; and conversely, a boiled emulsion which gives granular agglutination with a serum produced by a smooth form must itself be smooth.

(The emulsion is boiled to remove the heat-labile antigen, which is supposed to be connected with the flagella of the bacilli ; however, this appears to be done with greater precision by Bruce-White's method of treating the organisms with absolute alcohol for twenty-four hours at a temperature of 50° to 60° C. This latter method has been employed throughout the tests to be detailed further on, and the emulsions thus treated and deprived of their heat-labile antigens are called the "alcoholized emulsions" for the sake of brevity.)

To return again, then, to the Rawlins strain of *B. typhosus* which is used in making the Army T.A.B. vaccine.

Dr. Arkwright very kindly gave me a smooth form of a strain of *B. typhosus*, called "Mrs. S.," and when compared with this strain Rawlins certainly appeared decidedly rougher and deposited more quickly in broth. Rawlins did not, however, auto-agglutinate.

To apply Arkwright's last test, which he considers as the most reliable of them all, the following work was carried out :—

Three rabbits were given four intravenous doses of vaccine made with

the Rawlins strain; three more rabbits were given similar doses of "Mrs. S." strain.

Ten days after their last injection their sera were examined against an emulsion of "Mrs. S," killed with 0.2 per cent formalin, and also against an alcoholized emulsion of "Mrs. S."

The results of these agglutinations are given in Table I, from which it will be seen that those rabbits inoculated with "Rawlins" strain gave almost as good granular agglutination with the alcoholized "Mrs. S." emulsion as did the rabbits which had been inoculated with the "Mrs. S." strain, which is a known smooth form.

It may therefore be concluded that the form used for making the typhoid vaccine is a smooth one.

It will be seen that the sera of the Rawlins rabbits did not agglutinate to quite so high a titre as the sera of the "Mrs. S." rabbits, either in the floccular or the granular manner; it might seem therefore that "Mrs. S." is slightly the better antigen of the two.

The subsequent administration of a test dose of live *B. typhosus* to all six rabbits and two controls gave the following results:—

Rabbit 757, weighing 2,350 grammes,	died in 24 hours	..	} Inoculated with the "Rawlins" vaccine
.. 758, .. 2,750 ..	died in 24 hours	..	
.. 762, .. 3,050 ..	died in 24 hours	..	
.. 759, .. 3,000 ..	lived .. ..	..	} Inoculated with "Mrs. S." vaccine
.. 760, .. 2,500 ..	died in 24 hours	..	
.. 761, .. 2,075 ..	lived .. ..	..	
Control I, .. 2,500 ..	died in 24 hours	..	} Uninoculated
Control II, .. 2,500 ..	died in 48 hours	..	

All the rabbits passed watery fæces after the test dose. *B. typhosus* was isolated from the gall-bladders of all those that died.

The small number of rabbits used, and the comparatively huge doses of typhoid organisms that have to be given as the test dose, precludes one from drawing any definite conclusions from these results, but it does appear that possibly the Rawlins strain, though of a smooth variety, may not be quite such a good antigen as, for instance, the "Mrs. S." strain.

III.—Turning now to the second proviso of a good vaccine, i.e., the production of granular agglutinins in the blood of the inoculated persons.

Three sets of sera were examined for the presence of the granular agglutinins; they were:—

(a) The sera of rabbits inoculated intravenously with the vaccine (see Table I).

(b) The sera of men inoculated subcutaneously with the Army T.A.B. (see Table II).

(c) The sera of persons who were convalescent from an attack of typhoid fever (see Table III).

In the rabbits' sera there was a very considerable amount of granular agglutinins.

Only one amongst the inoculated men showed any granular agglutination.

And the typhoid cases not only showed no granular agglutination but the floccular agglutination was generally of a very low titre.

TABLE I.—THE AGGLUTINATION TESTS WITH THE SERA OF INOCULATED RABBITS.

Serum	Antigen	Agglutination titres					
		1/500	1/1250	1/2500	1/5000	1/12500	1/25000
A. Rabbits Inoculated with the "Rawlins" Vaccine.							
Rabbit No. 757 ..	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	+ f	—
	ditto alcoholized ..	+ g	+ g	+ g	—	—	—
Rabbit No. 758 ..	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	+ f	—
	ditto alcoholized ..	+ g	+ g	—	—	—	—
Rabbit No. 762 ..	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	+ f	+ f
	ditto alcoholized ..	+ g	+ g	—	—	—	—
B. Rabbits Inoculated with the "Mrs. S." Vaccine.							
Rabbit No. 759 ..	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	+ f	+ f
	ditto alcoholized ..	+ g	+ g	+ g	—	—	—
Rabbit No. 760 ..	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	+ f	+ f
	ditto alcoholized ..	+ g	+ g	+ g	—	—	—
Rabbit No. 761 ..	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	+ f	+ f
	ditto alcoholized ..	+ g	+ g	—	—	—	—

+ f = Floccular agglutination visible to the naked eye—Dreyers' technique.

+ g = Granular agglutination.

— = No agglutination.

TABLE II.—THE AGGLUTINATION TESTS WITH THE SERA OF MEN INOCULATED WITH T.A.B. VACCINE.

Serum	Antigen	Agglutination titres					
		1/50	1/125	1/250	1/500	1/1250	1/2500
Pte. T., inoculated 8 months previously	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	—	—	—	—
	ditto alcoholized ..	—	—	—	—	—	—
Pte. F., inoculated 10 days previously	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	+ f	—
	ditto alcoholized ..	—	—	—	—	—	—
Major W., re-inoculated 10 days previously	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	+ f	—
	ditto alcoholized ..	+ g	—	—	—	—	—
Pte. D., inoculated 10 days previously	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	—	—
	ditto alcoholized ..	—	—	—	—	—	—
Corpl. S., inoculated 10 days previously	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	+ f	+ f
	ditto alcoholized ..	—	—	—	—	—	—
Pte. N., inoculated 10 days previously	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	—	—
	ditto alcoholized ..	—	—	—	—	—	—
Pte. C., inoculated 10 days previously	<i>B. typhosus</i> "Mrs. S."	+ f	+ f	+ f	+ f	—	—
	ditto alcoholized ..	—	—	—	—	—	—

+ f = Floccular agglutination visible to the naked eye—Dreyer's technique.

+ g = granular agglutination.

— = No agglutination.



TABLE III.—AGGLUTINATION TESTS WITH THE SERA OF PERSONS CONVALESCENT FROM AN ATTACK OF TYPHOID FEVER.

Serum	Antigen	Agglutination titres									
		1/50	1/125	1/250	1/500	1/1250	1/2500	1/5000	1/12500	1/25000	
Banster, 8 weeks after onset	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	+	+	+	+	—	—	—	—	
Patchin, 8 weeks after onset	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	—	—	—	—	—	—	—	—	
Cairo case, ? date of onset	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	+	+	+	+	—	—	—	—	
Cable, 12 weeks after onset (Gravesend epidemic)	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	+	+	+	+	—	—	—	—	
Sanders, 9 weeks after onset (Gravesend epidemic)	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	+	+	+	+	+	+	+	+	
Morris, 3 months after onset (Gravesend epidemic)	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	+	+	+	—	—	—	—	—	
Victor Ward, 3 months after onset (Gravesend epidemic)	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	+	+	+	—	—	—	—	—	
W. Ward, 3 months after on- set (Gravesend epidemic)	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	+	—	—	—	—	—	—	—	
M. Ward, 3 months after on- set (Gravesend epidemic)	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	+	—	—	—	—	—	—	—	
M. Smith, 3 months after on- set (Gravesend epidemic)	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	+	—	—	—	—	—	—	—	
L. Mason, 3 months after on- set (Gravesend epidemic)	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	+	—	—	—	—	—	—	—	
Holdstock, 3 months after on- set (Gravesend epidemic)	<i>B. typhosus</i> "Mrs. S." ditto alcoholized ..	+	+	+	+	+	—	—	—	—	

Holdstock was inoculated several times during the war—the last time being in 1918. None of the other cases have ever received T.A.B. inoculations.

Holdstock's serum agglutinated *B. paratyphosus* B up to 1 in 50, none of the other sera showed any agglutination with *B. paratyphosus* A or *B. paratyphosus* B.

*B. typhosus* was isolated from Cable's faeces and Holdstock's urino.

The same emulsion of formalinized "Mrs. S." and alcoholized "Mrs. S." was used for all three sets of agglutinations.

It would appear from the foregoing results that the persons convalescent from typhoid fever are in exactly the same state of immunity or non-immunity as the inoculated men, and neither of them are so well protected as the rabbits!

Felix demonstrated granular agglutination in the sera of typhoid cases by using a strain of *B. typhosus* which was particularly sensitive to the heat-stable antigen agglutinin. It seems, however, that Arkwright's method of removing the part of the bacillus concerned with floccular agglutination and leaving the part associated with granular agglutination is far sounder than that of Felix, and, if his theories are correct, it should give an equally true result.

The small amount of antibodies, as represented by either floccular or granular agglutinins, in the blood of the typhoid convalescent cases, and the comparatively large amounts in the blood of the inoculated rabbits, are facts that can be much more easily explained by Besredka's theories in connexion with what he calls "local immunity" than by the generally accepted theories that centre round the "antigen mosaic" idea.

Besredka's theory is that immunity is conferred on the cells most affected by the disease, in this case the cells of the intestinal canal, and that the production of agglutinins in the blood is merely the reaction of the blood against a foreign body, and in no way a true measure of immunity to the disease.

He claims to be able to confer immunity without producing any agglutinins in the blood by giving the vaccine by the mouth.

*In Conclusion.*—After examining, in the light of Arkwright's work, the cultures at present being used in making our T.A.B. vaccine, it is evident that they are all the smooth forms of the respective organisms.

This is all to the good, in view of the very strong evidence that Arkwright and others have brought forward of the superiority of the smooth over the rough forms in their power of conferring protection.

Whether, however, we are justified in taking Arkwright's theories as a working hypothesis in our attempts to estimate the immunity conferred by a vaccine is somewhat open to doubt.

My thanks are due to Lieutenant-Colonel Gray, R.A.M.C., for allowing me to publish these notes, to Dr. Arkwright for his assistance and advice, and to Dr. Outred and Dr. Ponder for permitting me to investigate their cases and for putting their clinical and laboratory findings at my disposal.

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## AN EXPERIMENT IN MOSQUITO-PROOFING BARRACKS OF BRITISH TROOPS.

BY MAJOR A. CAMPBELL MUNRO,  
*Indian Medical Service.*

THE plains stations in Lahore military district are extremely malarious. For nine months of the year the health of troops is good, but in the post-monsoon period (roughly August to October) British troops suffer very heavily from malaria. The most unhealthy stations are Lahore and Amritsar, situated thirty-five miles apart. Table I illustrates this, and shows the "admission to hospital" rate per 1,000 of strength for (a) British troops, all India, (b) British troops in Lahore and (c) British troops in Amritsar:—

TABLE I.—MALARIA ADMISSION RATE PER 1,000 OF STRENGTH.

Year		All India		Lahore		Amritsar
1923	..	172·2	..	1077·1	..	564·4
1924	..	206·8	..	1038·3	..	1172·7
1925	..	159·0	..	706·2	..	825·7

In the period July to October, 1925, the company of the British infantry at Amritsar had 150 admissions to hospital for malaria in a strength of 227 men. At the end of the year this company was transferred to a healthy station, but in the year 1926 it furnished 198 admissions to hospitals for relapses of malaria acquired in Amritsar. Most of the company were under treatment off and on throughout 1926. In other words, the company was unfit for service for a whole year.

### LAHORE CANTONMENT.

Under its old name of Mian Mir this station has had a very unhealthy reputation since the middle of last century. After heavy rain, the clayey soil holds up surface collections of water for weeks. Canal irrigation water is distributed all through and around cantonments by unpaved channels, from which water leaks and forms pools. There are thus abundant breeding places for mosquitoes, and anopheline carriers are very numerous in the autumn.

For years antilarval measures have been carried out on the usual lines, but much hampered by shortage of funds. An extensive scheme of surface drainage by "pucca" drains could not be financed, and rough drains become a source of mosquito breeding. Moreover, such a scheme presents engineering difficulties, as the river Ravi is eight miles from cantonments, and there is practically no fall towards it.

Antilarval work has chiefly consisted of hand-spreading, oiling, or cre-soling collections of water, repairing drains and digging soakage pits, twenty feet deep, through the clay to the gravel below in low-lying areas where water collects.

Canal irrigation water was cut off between the years 1904 and 1917. This undoubtedly reduced malaria incidence, but the cantonments lapsed into an arid desert, and in 1917 canal water was reintroduced.

#### AMRITSAR.

Conditions favouring malaria, such as level ground, clay soil and irrigation are similar to those described at Lahore. The cantonment is a small one, housing one company only, and it is surrounded on all sides by highly irrigated land, over which the military authorities have no control. Anophelines are very abundant in the autumn.



Mosquito-proofed verandah. Shows proofed archways and entrance porch.

#### PERSONAL PROTECTION.

In both stations proper care and use of mosquito nets are enjoined on all ranks. The wearing of shorts after dark is forbidden, and night sentries smear their faces and hands with bamber oil, a stock of which is kept in every guard-room. The barracks are regularly fumigated with sulphur or cresol vapour to kill adult mosquitoes. The mosquito net is without doubt surreptitiously discarded by the men at times on hot nights. Moreover, the soldier's bed is only two feet nine inches wide, and portions of a man's body must frequently rest against the net and be exposed to mosquito bites.

## MOSQUITO-PROOF BARRACKS SUGGESTED.

The scheme of proofing barracks was first suggested as a policy of despair, since conservative methods, applied for twenty years on the scale rendered possible by financial considerations, had definitely failed.

But the recent work on the habits of anopheline mosquitoes, by S. P. James, M.D. (League of Nations—Health Organization pamphlet, C.H., "Malaria," 57 (1), published Geneva, 1926), suggests that rendering the barrack-room free from mosquitoes is not only the best, but might well be the only antimalarial measure holding out any hope of success.

Briefly, James finds that the following factors govern the ability of *Anopheles maculipennis* to become infective: (a) A specially infective donor suffering from a relapse of malaria is required. (b) The mosquito should have several opportunities of biting the donor. (c) At high temperatures (such as prevail in the hot weather in India) it is necessary for the mosquito to feed every day on human blood. (d) The ingestion of other food than blood, such as fruit and vegetable juices, is an adverse factor.

The darkened barrack-room, containing anything up to 200 men, many of them infected with malaria, appears to provide the exceptionally favourable environment for mosquitoes living in it that is indicated above.

James argues that it is possibly a waste of effort to carry out a scheme directed against a million larvæ, instead of against, say, fifty of the adult mosquitoes that will be favourably enough situated to become malaria transmitters.

The following is an observation that favours this view:—

The British officer does not spend the malaria season in a crowded barrack-room. He has a room to himself, often a whole house, as his family is in the hills. Anophelines living in his house do not enjoy the very favourable conditions for the transmission of malaria that the barrack-living mosquito does.

Even in very malarious stations in India the officer suffers far less than the soldier. For example, in 1925, when the malaria admission rate among British other ranks in Lahore was 706·2 per 1,000 of strength, the ratio for British officers was only 87·9 per 1,000.

## METHOD OF PROOFING BARRACKS.

The barracks to be proofed were long, single-storey bungalows, each accommodating about 150 men. Along each side of the bungalow ran a verandah, twelve feet broad. The outside wall of the verandah was pierced by a series of archways, nine feet broad at the ground level and about twelve feet high.

As the men generally sit about on the verandahs in the evenings, it was not considered sufficient to proof merely the barrack-rooms, so the archways of the verandahs were proofed.

A stout wooden framework was made to fit each archway, and was let two inches into the wall face of the arch. The space inside this framework was subdivided by lighter wooden cross-pieces into squares of one and a half feet dimension. To this framework brass wire gauze, sixteen by sixteen meshes per square inch, was nailed. To strengthen the gauze, half an inch rabbit netting was nailed over it.

*Doorways* in the proofing were double, with a ten-feet proofed gangway between the two doors. This prevented a man opening both outer and inner doors at the same time when passing through them.

Doors opened outwards, to prevent mosquitoes that rested on the doors being carried into the barracks when the door was opened.

All doors were fitted with double springs to ensure self-closing.

*Windows* in barracks are of the clerestory type, about three feet square. A gauze frame was fastened over the outside of each window, so designed as to allow the window to open.

*Fireplaces* were temporarily filled up with brick for the hot weather. All ventilators were covered with wire gauze.

As soon as the structural work was completed, very thorough fumigation of the barracks with sulphur and cresol vapour was carried out to destroy mosquitoes already in the rooms. This fumigation was repeated monthly, to deal with any stray mosquitoes that might have penetrated the defences.

#### PRESERVATION OF THE PROOFING.

One man per barrack-room was detailed for the sole duty of attending to tears in the wire gauze. He inspected every archway daily, and darned patches of gauze over any tears he found. Frequent inspections were also made by medical and regimental officers. It was made a court-martial offence to prop a spring door open, or to pass through a door so propped open without removing the obstacle.

Well-seasoned wood was used for doors and frames, but some warping occurred. This was always rectified at once, and the opposing surfaces of doors were lined with leather to ensure effective apposition. All gauze had to be brushed frequently with scrubbing brushes to prevent obstruction to light and air by dust.

#### BARRACKS PROOFED.

All British barracks in Amritsar cantonment and the British Military Hospital were proofed. In Lahore, the British Infantry barracks and the British Military Hospital only were proofed. In both stations, the Soldiers' Institutes in barracks were included in the proofing; many of the men spend their evenings in the institutes, which comprise supper rooms, canteens, reading rooms, billiard rooms, etc.

All the buildings in Amritsar were proofed and fumigated by December, 1925. In Lahore the work was completed by July, 1926.

## ADVANTAGES OF PROOFING INDEPENDENT OF MALARIA PREVENTION.

Frequent visits to proofed barracks during the hot weather of 1926, and many conversations with officers and men, have convinced me that the following advantages are real and are greatly appreciated by the inmates:—

(1) The men are able to dispense altogether with mosquito nets, and to have their punkhas lowered to just above their bodies at night. Where a net is used the punkha is four feet above the man, and by actual experiment I have satisfied myself that no breeze from the barrack punkha, playing at this height through a mosquito net, is perceptible to a man lying on the bed. The discomfort and sleeplessness experienced in a barrack-room containing 150 men on a June night, when the indoor temperature is 90° to 100° F., can be imagined. Incidentally, it results in the men throwing off their nets and exposing themselves to mosquitoes.

(2) The men are not annoyed by flies or by the many non-biting insects (flying beetles, etc.) that appear in the rains.

(3) They are protected during the invasion of culex mosquitoes that occurs in the early summer. In Amritsar, in April, 1926, not a mosquito could be found in barracks or hospital, while they swarmed in officers' (unproofed) bungalows in the station.

The bites of these culex mosquitoes, superimposed on prickly heat, add greatly to the discomfort of the men in the early hot weather, and are a cause of many admissions to treatment for minor septic diseases.

(4) Temperatures taken in proofed and unproofed barracks in Lahore, during a hot spell in July, 1926, gave a uniform lower reading, averaging 2° F. in the proofed rooms.

## PREVALENCE OF MALARIA IN THE PUNJAB IN 1926.

Before initiating an inquiry into the effect of mosquito proofing in 1926, it is necessary to know to what extent malaria was prevalent in that year. Normally, the population of the Punjab suffers heavily in the autumn, but exceptional years occur, such as 1902 and 1922, when comparatively little malaria occurs. This variation in epidemicity depends on the amount and character of the monsoon rains, and the atmospheric temperature and humidity after the rains, owing to the effect of these factors on the life history of the mosquito and the sexual cycle of the malarial parasite.

Two methods of estimating the epidemicity of malaria in any particular year are available:—

(1) The malaria figures for the civil population. These are calculated from (a) the malarial death-rate, and (b) the number of cases of malaria attending civil dispensaries and hospitals.

(2) The malaria admission rate among Indian troops to military hospitals. This rate reflects the comparative prevalence, one year against another, of malaria in the civil population, as Indian troops are not so well protected as British troops against mosquito bites; also, there is a steady

influx of leave men and recruits in the malarial season who have been totally unprotected at their homes.

As regards (1), the Director of Public Health, Punjab, reports that the malaria epidemicity of 1926 in the Lahore-Amritsar area was *above* the normal.

As regards (2), the following figures show that among Indian troops in Lahore, 1926 was a year of normal malaria prevalence :—

TABLE II.—INDIAN TROOPS, LAHORE CANTONMENT.

Year		Average strength		Malaria admissions		Ratio per 1,000 of strength
1923	..	2,203	..	875	..	397·2
1924	..	2,298	..	883	..	385·1
1925	..	2,553	..	913	..	357·6
1926	..	2,434	..	883	..	362·8

#### COMPARISON OF MALARIA INCIDENCE ON PROOFED AND UNPROOFED TROOPS.

Having established the fact that the year 1926 was not a year of low malaria prevalence, due to climatic conditions unfavourable to the disease, a comparison can now be made between the health of troops in 1926 in proofed barracks with that of troops who lived in the same (but unproofed) barracks in previous years.

Table III gives the figures for Amritsar :—

TABLE III.—BRITISH INFANTRY COMPANY, AMRITSAR CANTONMENT.

Year		Average strength		Malaria admissions		Ratio per 1,000
1923	..	187	..	124	..	663·1
1924	..	192	..	255	..	1328·1
1925	..	192	..	178	..	927·1
1926	..	153	..	39	..	254·9

A fallacy, which to some extent invalidates the comparison made in Table III, exists in the fact that the company garrisoning Amritsar is changed about four times a year. This causes confusion in the figures of malaria acquired in Amritsar and elsewhere.

One of these reliefs takes place in July, when a company that has spent the first half of the summer in a non-malarious hill station comes to Amritsar, where it remains until early November. Now, nearly all the fresh malaria in Amritsar occurs between the months of August and October. A comparison is therefore shown in Table IV for four years for the detachment which spent there the three malarial months August to October :—

TABLE IV.—BRITISH INFANTRY COMPANY, AMRITSAR CANTONMENT.  
August 1 to October 31.

Year		Average strength		Malaria admissions		Ratio per 1,000
1923 (unproofed)	..	166	..	118	..	710·8
1924 (unproofed)	..	194	..	145	..	747·4
1925 (unproofed)	..	199	..	121	..	608·0
1926 ( <i>proofed</i> )	..	146	..	25	..	171·2



In the case of Lahore, figures must be *confined* to the malarial season, i.e., the months of August to October, since : (a) The Lahore barracks were not completely proofed until July, 1926, and (b) the unit which occupied the barracks throughout the malaria season of 1926 left Lahore early in November, 1926.

Table V gives the figures for the British Infantry Battalion for 1926 and the preceding three years :—

TABLE V.  
*August 1 to October 31.*

Year	Average strength	Malaria admissions	Ratio per 1,000
1923 (unproofed) .. .. .	588	500	850·34
1924 (unproofed) .. .. .	489	236	492·62
1925 ( <i>Napier lines only</i> ) (unproofed) ..	281	160	569·40
1926 „ „ „ ( <i>proofed</i> ) ..	302	55	182·12

#### COMPARISON WITH “CONTROL” (UNPROOFED) BARRACKS.

In Amritsar cantonment there are no troops other than the company living in the barracks now proofed.

But in the case of Lahore cantonments a control experiment exists, in that there are three other units in cantonments whose barracks are still unproofed. These units enjoy no healthier site than the British Infantry battalion. In fact, as Table VI shows, the British Infantry suffered more severely from malaria in each of the three preceding years than did the “other British units.” The barracks of one of these three units (Armoured Car Company) are separated only by a road from Napier lines.

TABLE VI.  
*August 1 to October 31.*

BRITISH INFANTRY BATTALION.				OTHER BRITISH UNITS.		
Year	Average strength	Malaria admissions	Ratio per 1,000	Average strength	Malaria admissions	Ratio per 1,000
1923	588	500	850·34	352	190	539·77
1924	489	236	482·62	309	95	307·44
1925	281	160	569·40	334	157	470·06
1926	302	55	182·12	293	197	672·35

#### STATISTICAL CONCLUSIONS.

In the year 1926, when malaria was as prevalent as usual, and no special antilarval campaign was carried out :—

(1) The malarial rate in proofed barracks in Amritsar was *one-fourth* the average rate in the same, but unproofed, barracks in the three preceding years.

(2) The malaria rate in proofed barracks in Lahore was *one-fifth* the average rate in the same, but unproofed, barracks in the three preceding years.

(3) The malaria rate in proofed barracks in Lahore was *less than one-third* the rate in unproofed barracks in the station in the same year.

GENERAL CONCLUSIONS.

Mosquito proofing of barracks, properly carried out, is a certain means of reducing malaria among troops living under peace conditions. This reduction is effected by protecting the men *absolutely* for the majority of the dangerous hours, i.e., the hours between sunset and sunrise, daily.

It will never as a solitary antimalaria measure stamp out malaria entirely, since men can still be infected out of barracks. Its efficacy will vary in inverse ratio to the evening attractions in the station outside of barracks.

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## BERI-BERI IN ADEN.

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CASES of beri-beri and of beri-beri group syndrome (D.A.H., neuritis, œdema, myalgia, dropsy), have occurred in Aden since 1915, if not from an earlier date.

These cases have, at any rate latterly, been confined to British troops (other ranks).

Indian troops (with the exception of one case in a follower in 1925) and the local civil population, so far as has been ascertained, have not been affected. British officers, women and children appear to have been exempt. (One officer has recently had symptoms.) No cases have occurred in the Royal Air Force or the Royal Navy. (Note: Cases are now reported, January, 1927, in the Royal Air Force and in Indian troops.)

There is a definite seasonal incidence, having its maximum in the months of July to October, and it has been suggested that there is a relationship between the malarial epidemic years and the beri-beri epidemics, also some association of the latter disease with a form of clinical (bacillary type) dysentery.

Owing to war conditions the figures for beri-beri cannot be regarded as either complete or accurate up to the year 1922.

Since 1922 more or less definite figures are available from the returns, and this note is limited to observations on the data available for the quinquennial period 1922-26 inclusive.

The following table shows the incidence in these years:—

ADEN. BRITISH TROOPS.

Year	Beri-beri	Peripheral neuritis	D.A.H.	Edema	Myalgia		Dropsy	Total
					Hospital	Barracks		
1922	4	6	3	1	22	87	—	73
1923	—	—	2	—	1	45	—	48
1924	54	2	13	—	2	24	—	95
1925	8	1	1	2	3	17	—	32
1926	3	64	5	1	8	77	—	158
Total	69	73	24	4	36	200	—	406

1922.

In 1922, on the occurrence of the four cases of beri-beri, the issue of eggs and fish was recommended for British troops as a temporary measure. Its continuance as a permanent measure was not then considered necessary.

## 1923.

In 1923 no cases of beri-beri were diagnosed, but forty-six cases of myalgia occurred.

## 1924.

The occurrence of a fresh outbreak in 1924 (with one fatal case) resulted in sanction by cable for the addition of the following extra articles to the ration scale of the British troops:—

Eggs	..	..	..	2 daily
Marmite	..	..	..	½ oz. twice weekly

(The opportunity was also taken to include fresh fruit, 8 oz. daily, and beans, dried, 2 oz. twice weekly (for germination), owing to the difficulty of procuring fresh vegetables.)

These extras were sanctioned for a period of three months in the first place; in December, 1924, sanction was accorded to their issue for a further period of three months.

On October 15, 1924, a special scale of rations was recommended for the garrison at Aden.

This scale included the following articles for British troops:—

Bread	..	..	..	1 lb. (half of ration to be wholemeal— atta—twice weekly)
Eggs	..	..	..	2
Beans, dried	..	..	..	2 oz. twice weekly (for germination)
Vegetables, fresh	..	..	..	Better quality
Fruit, fresh	..	..	..	4 oz. daily when available

In March, 1925, the following were sanctioned as a permanent issue to British troops in Aden, and these were actually issued from April 1, 1925:—

Eggs	..	..	..	2 per man per diem
Beans, dried	..	..	..	2 oz. per man twice weekly
Vegetables, fresh	..	..	..	As before: better quality
Fruit, fresh	..	..	..	4 oz. per man per diem

The issue of wholemeal or atta bread was delayed for various reasons and did not actually commence until December 10, 1926.

Marmite, on the scale of a quarter ounce per man, twice weekly, when considered necessary by the medical authorities, was authorized in December, 1924, and this extra has been issued during the following periods:—

July, August, September, 1925,  
July 1 to 30, 1926,  
August 7 to 29, 1926,  
September 19 to October 18, 1926,

and is being continued at present.

In 1925 powers were given to General Officers Commanding Districts and Independent Brigades to sanction, on the recommendation of the local medical authorities, extra rations to British and Indian troops for a period of thirty days, when epidemic diseases such as beri-beri, scurvy, etc., occur

or are anticipated. These extra rations are other than those included in the normal peace rations or their substitutes.

As the result of correspondence with Lieutenant-Colonel H. W. Acton, I.M.S., who has expounded a theory regarding the infection of rice with a sporing, *vulgatus*-like bacillus, and its relation to the beri-beri group syndrome, it was recommended in December, 1926, that the issue of rice to British troops in Aden be stopped, and also that the purchase of rice locally be prohibited.

The rice supplied to Aden originates from Burma, and is identical with that supplied to troops in the whole of India, except in a few stations in the north-west (whose rice comes from Kashmir). Its method of storage and transport are said to differ in no way as regards Aden from any other destination, and it is supplied to localities where it is subjected to the same conditions of temperature and humidity as in Aden.

During the year 1926, fifty-three cases of the beri-beri group syndrome (all B.O.R.) have been invalided from Aden.

With regard to other cereals, large reserves of flour and atta are stored in Aden. Until July, 1926, a reserve supply for 105 days was maintained. As the flour takes three weeks from Lyallpur flour mill to Aden and a fourteen days' maintenance stock is also kept up, it appears that the flour issued at Aden was 140 days (roughly five months) old.

Lyallpur to Aden .. .. .	21 days
Reserve stock .. .. .	105 "
Maintenance stock .. .. .	14 "
<b>Total ..</b>	<b>140 days</b>

Since July, 1926, the reserve stock has been reduced to forty-five days. At present, therefore, flour is eighty days old when it is issued to the troops.

It has been suggested that in the years 1924-25-26 "there is a very definite time relationship between the issue of marmite and the occurrence of cases of beri-beri," and that "there is also some ground for supposing that in seasons when marmite was issued the type of case was less severe."

Marmite is now being issued on the scale of a quarter ounce on four days per week.

There are three "standard" theories regarding the causation of beri-beri:—

- (a) Deficiency of vitamin B.
- (b) Infection by a specific micro-organism, associated with overcrowding.
- (c) Toxæmia from rice (or other cereal) contaminated during storage.

It is generally accepted that individuals may live in a state bordering between vitamin sufficiency and starvation, and that in such individuals any undue stress or strain may precipitate the onset of acute signs and symptoms of the disease.

The mere presence in adequate quantity of vitamin B containing substances in the diet is modified in importance by the essential factor of their balance with the carbohydrate constituents of that diet. The proportion of that balance is, apparently, not yet governed by any rules.

The average vitamin B content of a normally nourished adult is stated to be sufficient to withstand some three months of vitamin starvation. (The average "incubation" period of the 1926 beri-beri cases in Aden is ninety-eight days.)

The ration at present being issued to British troops in Aden is as follows :—

Bread .. .. .	1 lb. (half to be wholemeal bread, twice weekly)
Flour .. .. .	4 oz.
Meat, fresh .. .. .	1 lb.
Onions .. .. .	6 oz.
Potatoes .. .. .	10 oz.
Salt, ration .. .. .	$\frac{3}{4}$ oz.
Sugar .. .. .	$2\frac{1}{2}$ oz.
Tea, ration .. .. .	$\frac{1}{2}$ oz.
Vegetables, fresh .. .. .	8 oz. (better quality)
Firewood, ration, split .. .. .	3 lb.
Beans, dried (for germination) .. .. .	2 oz. (twice weekly)
Fruits, fresh .. .. .	4 oz.
Eggs .. .. .	2

Note.—Marmite,  $\frac{1}{4}$  oz., is being issued on four days a week.

The ration of the British troops in Aden contains therefore the following vitamin B containing substances which are not issued to the troops in India or Burma, viz. :—

Wholemeal (or atta) bread .. .. .	Twice weekly
Eggs .. .. .	2 per day
Marmite .. .. .	$\frac{1}{4}$ oz. on 4 days per week.

The attached statement (A) shows the incidence of cases from November 4, 1926, to date.

Should cases occur during 1927, while these measures are in force, it will establish two strong presumptions with regard to the cause of beri-beri in the British troops in Aden :—

(1) That it is not in any way connected with rice (since rice eating is prohibited).

(2) That it is not due to a deficiency of vitamin B (since the special Aden ration + marmite provides this substance in plenty).

It is suggested as a possibility that the cause may be associated with the issue of *old flour*, owing to the prolonged storage of this commodity in Aden. This would also explain the fact of its occurring chiefly amongst British troops, as the consumption of ration flour is practically confined to them.

There is a further possibility, viz., that faulty cooking may be concerned,

as was reported to be the cause of the outbreak at Lebong in 1912. This is under investigation.

The question of toxæmia from rice or other cereal is to be the subject of special investigation.

#### STATEMENT "A."

##### BERI-BERI. ADEN, 1926.

*Statement showing admissions, by weeks, for the undermentioned diseases amongst the troops and followers in Aden.*

Week ended	D. A. H.		Myalgia		Neuritis		Beri-beri		Oedema		Dropsy	
	British troops	Indian troops and followers	British troops	Indian troops and followers	British troops	Indian troops and followers	British troops	Indian troops and followers	British troops	Indian troops and followers	British troops	Indian troops and followers
4.11.26	—	—	—	—	3	—	—	—	—	—	—	—
11.11.26	—	—	—	—	1	—	—	—	—	—	—	—
18.11.26	—	—	1	—	3	—	—	—	—	—	—	—
25.11.26	—	—	—	—	9	—	—	—	—	—	—	—
2.12.26	—	1	—	—	4	—	—	—	—	—	—	—
9.12.26	1	—	1	—	2	—	—	—	—	—	—	—
16.12.26	—	—	—	—	—	—	—	—	—	—	—	—
23.12.26	—	—	—	—	—	—	—	—	—	—	—	—
30.12.26	—	—	—	—	—	—	—	—	—	—	—	—
6.1.27	—	—	—	—	2	—	—	—	—	—	—	—
13.1.27	—	—	—	1	2	1	—	—	—	—	—	—
20.1.27	—	—	—	—	1	—	—	—	—	—	—	—
27.1.27	—	—	—	—	3 <sup>1</sup>	—	—	—	—	—	—	—
3.2.27	1	—	—	—	7 <sup>2</sup>	—	—	—	—	—	—	—

The cases are distributed over:—

- (a) *Hutment at Tarshyne Fort Barracks.*
- (b) *Barrack Hill.*
- (c) *Chapel Hill Barracks. Blocks 2 and 5.*
- (d) *R.A.F. Lines, Khormaksar.*
- (e) *Front Bay Barracks.*
- (f) *Block No. 25, Indian Military Hospital.*
- (g) *Indian Infantry Lines, Crater.*

<sup>1</sup> One case in R.A.F.

<sup>2</sup> Five cases in R.A.F.

## THE FORECASTING AND CONTROL OF CHOLERA EPIDEMICS IN INDIA.

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*(Continued from p. 192.)*

### ALL-INDIA CHOLERA EPIDEMICS AND THEIR CAUSATION.

A CHART of the annual cholera incidence for all India shows variations between 0·16 in 1874 and 0·30 in 1923 to 3·39 in 1877, chiefly in Madras and Bombay, 3·50 in 1892 and the record rate of 3·70 in 1900, while the average for the decade ending 1920 was 375,000 yearly. It has long been known that famine years are bad ones for cholera, and the terrible death-rate, 12·20 per mille, in 1877, in Madras was associated with the worst known famine due to repeated failure of rains, while Cornish pointed out that several earlier bad Madras epidemics had a like causation. Similarly the 1892 and the 1900 epidemics followed early cessation of the previous monsoon and very low winter rains, leading to scanty and impure water supplies, while the disease is very liable to break out in famine camps. Taking the three great epidemic years mentioned, together with the ten other years with well over the average all-India cholera incidence, I have prepared tables of all the areas in each year in which there were exceptionally high cholera rates, and have entered against each the deficiency or excess of the rainfall at the end of the previous monsoon, and also during the ensuing winter months, and I found deficient rain in no less than forty out of the forty-one areas tabulated, the only exception being in the United Provinces in 1894, with excess of both rain and cholera; this will be explained later. Deficient rainfall, even when not such as to produce famine, is thus clearly one of the most important factors in predisposing to cholera epidemics, and one demanding more detailed study Province by Province. This I have since carried out with most striking corroboration of the value of monthly rainfall in forecasting cholera epidemics, which I shall have to return to presently.

*Pilgrimages* constitute the other great factor in the spread of cholera in India, details of which will be dealt with under the different Provinces, but some idea of its importance may be gathered from the fact that tables which I have worked out of the yearly attendances at pilgrimages and fairs with 10,000 or more people show approximately 20,000,000 persons, including nearly 5,000,000 in each of Bihar and Orissa and the United Provinces, the great majority of whom in their travels pass through the endemic cholera areas, with inevitable extensive spread of the disease; this factor being far more important than the actual amount of cholera at the actual sites of the fairs, and one not sufficiently recognized in the prophylactic measures hitherto relied on.



## PROVINCIAL CHOLERA INCIDENCE AND SPREAD.

Having established that the variations in the absolute humidity deficiency of autumn and winter rains, but not necessarily the total rain of any year, and the movements of pilgrims through or to and from the endemic areas are the most important general factors influencing cholera incidence in India, I now turn to the application of these principles to explain the yearly variations of cholera in different parts of India, and shall have to



FIG. 10.

consider first the causation of the frequent recrudescences of epidemics in the endemic areas themselves, and subsequently the factors influencing the invasion of the epidemic areas from the endemic ones. We shall find that deficient rainfall is the most constant factor leading to increased incidence in the endemic areas, but that exceptionally large special pilgrimage years play a very important part, and that some of the most striking exceptions

to the general rule are related to unusually high or low absolute humidity in the winter or spring months; all these factors having to be taken into consideration to allow of forecasts of cholera incidence being made. Another essential factor, which is more important in relation to epidemic areas, is that after a very severe epidemic very low rates usually occur in the following year, with the result that in such a year low rainfall may have little effect in producing another epidemic, a considerable degree of immunity remaining after that of the previous year, and this may apply to individual divisions or even districts.

#### EPIDEMIC RECRUDESCENCES IN THE ASSAM, BENGAL, BIHAR AND ORISSA, AND UNITED PROVINCES ENDEMIC AREA.

We may first consider the causation of the epidemics in this vast north-east endemic area, and incidentally see if there is any evidence of spread north-westward from Lower Bengal of Bryden's endemic area as held for a century.

*Assam* consists of the long Brahmaputra Valley north of the Garo and Khasia Hills and the shorter Surma Valley to the south, no reliable data being available for the hill section itself. As the average rainfall is from 95 to 125 inches annually, and failures causing famines are unknown, it would hardly at first sight be expected to find any close relation between rainfall and cholera in these separate valleys, in which the curves of the annual variations in the cholera rates per mille are extraordinarily similar, for of the seventeen rises in each valley there occurred in the same year no less than fifteen, in spite of the very difficult and scanty communications between the two valleys. We must, therefore, look for some common cause affecting both valleys. I have worked out tables of the rainfalls in every year in which cholera was fifty per cent over the average of thirty recent years, and found twelve such years in the Brahmaputra, and nine in the Surma Valley with the higher rainfall, and the remarkable fact became apparent that in every one of the nine years with excess of cholera in the Surma Valley there was also excess in the Assam Valley, and in all of them there was a greater or less deficiency of the previous autumn and winter rains; clearly showing the importance of this factor in bringing about the excess in both valleys, and accounting for the very close similarity in the incidence curve in these two valleys separated by a mountain range, but both receiving their rainfall from the same Bengal branch of the south-west monsoon current. As pilgrims are very few in Assam the primary importance of the rainfall factor thus stands out in a most striking manner, and that, too, in spite of the rains never failing to any material degree in this very humid area.

*Lower Bengal*, immediately to the west of Assam, is a great home of cholera, and is therefore of primary importance with regard to the supposed spread of epidemics all over India from Bryden's endemic area. Yet the

yearly incidence of cholera from 1877-78 (to include the early autumn rise in this area) to 1920-21, so far from showing unusual epidemic prevalence, reveals the least yearly variations of cholera of any part of this great endemic area or that of south-east Madras, the disease never having fallen below 0·88 or risen over 5·10 per mille. In the case of the Presidency and



FIG. 11.

Burdwan divisions there was a close relationship between low autumn and winter rains and subsequent excess of cholera, but this was not so in the Dacca division, where the water levels depend on the height of the great Ganges and Brahmaputra rivers which meet here, high river levels with floods in the rains, followed by low ones in the early winter, being associated with excess of cholera. Curves of the yearly incidence showed frequent rises in the same years in Eastern Bengal and in Assam, but not so

frequent a similarity between rises in Eastern and Western Lower Bengal, showing that as a rule the disease is only epidemic in part of the Province at a time ; once more yielding no indication of great spreading epidemics arising in Lower Bengal, which is less liable to them than either Assam or Bihar and the United Provinces on either side, and so lending no support whatever to the old theory.

*Bihar and Orissa*, which formed part of the Bengal Province up to 1904, consists of three very distinct portions. The Southern Orissa division, with the Puri pilgrimage, once more shows excess of cholera following deficient autumn and winter rains to a remarkable extent, and these epidemics are responsible for the invasion of the Eastern Chattisgarh division of the Central Provinces, nearly always through Puri pilgrims, and also of the north-eastern coast districts of Madras in a similar manner. The elevated plateau of Chota Nagpur suffers least of the three divisions, and is invaded from either Orissa to the south or from Bihar on the north, but has a small population. Bihar, with its dense population and good communications, forming part of the Ganges Valley between Lower Bengal on the east and the eastern divisions of the United Provinces to the west, forms a most important part of the great north-east endemic area, and presents points of especial interest. In the first place I have shown in a chart (fig. 11) the rates per mille for thirty-five years for Dacca, the Presidency and Burdwan divisions of Lower Bengal, Bihar and the Eastern and Western Divisions of the United Provinces respectively. The chart clearly shows the closest relationship between the curve of Bihar and Eastern United Provinces, all the greatest epidemics in which involved both areas in the same years, and three of the four most severe ones occurred in the only three Allahabad Kumbh Fair years of the period, namely, in 1894, 1906 and 1918, the fourth being the record year for all India of 1900. No such close relationship is shown between any of the other contiguous areas, the curve of the Western United Provinces even being quite different from that of the Eastern divisions of the same Province, the reason for which will appear presently. Moreover, in my forty-five yearly maps of the cholera incidence in the forty-five divisions of India I entered the months of the first rise and the maximum incidence of each division, which show that on several occasions, so far from cholera spreading from Lower Bengal through Bihar to the United Provinces, the very reverse was the case, especially in Allahabad Kumbh Fair years, when the West Bihar division showed a rise a month later than the Eastern United Provinces, thus indicating the immense importance of the movement of several million pilgrims through this densely-populated endemic area.

Another point of interest, confirming in a striking manner the conclusion just come to, is that I found a close relationship between low autumn and winter rains and succeeding high cholera in Bihar, except that in four years high cholera occurred without previous low rainfall, and these were all Allahabad Kumbh years, showing that unusually great pilgrim traffic

will result in high cholera without favouring low rainfall. The Allahabad Kumbh pilgrim years are, therefore, the essential cause of nearly all the cholera epidemics of this area, even when there may be little or no cholera actually at the fair itself, which fortunately takes place in January and February, when the low absolute humidity is usually unfavourable to the spread of the disease. The yearly variations in this factor may, however, greatly influence the spread of cholera, as the following remarkable examples will show. In 1882, in the absence of previous sanitary precaution C. Planck found about 100 dead and dying of cholera in the huge camp on the river sands, but was much surprised that no rapid spread followed the dispersal of the pilgrims, although they carried the disease away with them in the crowded trains. Yet in 1894, with elaborate sanitary precautions, although only a few cases of cholera occurred in Allahabad city at the end of the fair, cholera spread rapidly with the highest incidence in my chart in in the Eastern United Provinces. I found the explanation in the fact that my tables show a record low absolute humidity in the early months of 1882, inhibiting the spread of the disease, and nearly the record high rate in 1894, greatly favouring epidemic recrudescence; and it is still more remarkable that this last epidemic was the one exception in the forty-one instances already referred to, in which high cholera occurred with high previous rainfall; the combination of the Kumbh Fair, with about 3,000,000 pilgrims, and the exceptionally high absolute humidity for the time of the year, sufficing to account fully for this exception.

In the *United Provinces* cholera incidence shows great yearly variations, and, as shown by the chart (fig. 11), the incidence in the eastern divisions is closely related to that in the neighbouring Bihar and to the Allahabad Kumbh Fairs, but the western divisions show a very different incidence, which remains to be explained. In both areas there is a very close relationship between deficient autumn and winter rains and subsequent high cholera, but just as this is modified in the case of Bihar and the eastern part of the United Provinces by the great influence of the Allahabad-Kumbh Fairs every twelfth year from 1882 on, so the incidence in the western part of the United Provinces, as well as in the adjacent Punjab, is influenced very greatly by the Hardwar Kumbh Fairs every twelve years, from 1867 onwards to 1915, one of which will recur once more in the present year. These facts are illustrated by the yearly incidence of cholera in the United Provinces. In every Hardwar Kumbh year, except 1891, there was high incidence of cholera in both the Western United Provinces and in the Punjab, while a very severe epidemic in the same areas occurred in 1892, in spite of the Hardwar Fair that year being the usual comparatively small one, showing that the elaborate sanitary arrangements of 1891 were not the sole cause of comparatively low cholera that year, since similar measures completely failed to avert an epidemic under far more favourable circumstances in the following year. Here, once more, I find the true explanation in the absolute humidity data, for the readings were exceptionally low in

the spring of 1891, affording unfavourable conditions for the spread of the disease from the Hardwar Fair that year, while in 1892 higher absolute humidity readings favoured the spread of the disease; an important point, which should allow of the sanitary authorities fore-arming themselves with the knowledge of this very potent factor in future. In 1891, too, there was also less cholera than usual in the Western United Provinces to be spread by the pilgrims. The remarkable differences in the epidemic years

Chart Annual Cholera Incidence in Punjab 1885-1920

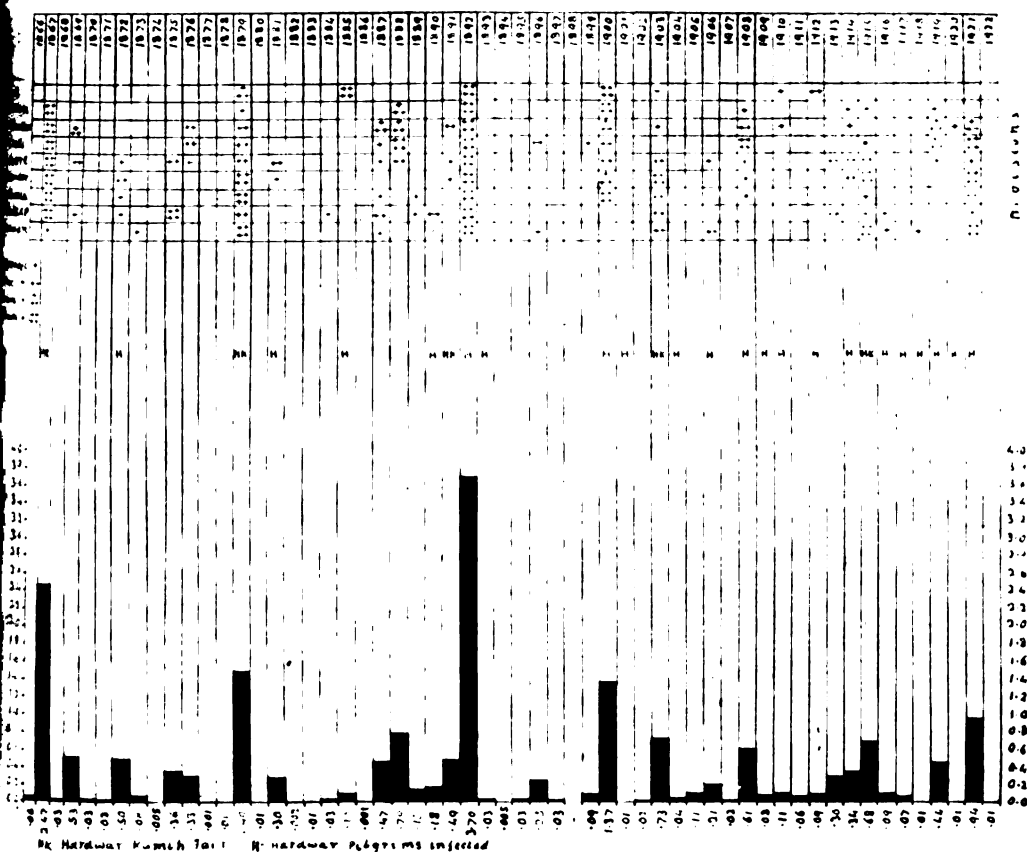


FIG. 12.

in the eastern and western divisions of the United Provinces furnishes yet another proof that cholera does not spread from Bengal to the Punjab in epidemic waves, as hitherto thought. In fact, the epidemic recrudescences in Bihar and both the East and the West United Provinces are due to local conditions of rainfall, absolute humidity and pilgrimages, so can be foreseen in future to a very large extent by keeping an eye on the causative factors in the Province instead of watching uselessly the incidence in Bengal, as hitherto.

## THE INVASION OF THE PUNJAB EPIDEMIC AREA.

I now come to the most important part of my subject, namely, the causation of the frequent epidemic invasions of the Punjab from the endemic areas of the Western United Provinces, for if we can foresee such epidemics in the future it should be possible to control them to a great extent by prophylactic measures, as will appear presently. The accompanying chart (fig. 12) illustrates the yearly incidence per mille of cholera in the Punjab for 57 years from 1866 to 1922, during which it showed the extreme variations from nil or under 0·01 in six years and under 0·05 per mille in seventeen more years, to 3·70 in 1892. In the first two decades of the chart by far the highest cholera rates were 2·47 in 1867, and 1·49 in 1879, both due to epidemic spread from the great twelve-yearly Kumbh Hardwar Fairs of those years. In the next Kumbh Hardwar year of 1891 the rate only rose to 0·49, mainly owing to the unfavourable absolute humidity; but the most disastrous invasion of the Punjab occurred in 1892, directly due to an outbreak at the ordinary Hardwar Fair, with 3·70 per mille. The next important epidemic was in the record year for India, 1900, due to low preceding rains; but the highest rises in the next two decades again occurred in the Kumbh Hardwar Fair years of 1903 and 1905, and the last severe epidemic took place in the bad cholera year of 1921, once more following deficient rainfall. Moreover, I find that from 1889 to 1922 every year in which cholera in the Punjab rose to 0·40 or more per mille the importation of the disease was traced to Hardwar pilgrims, so definite is the relationship to that event, even in ordinary years with only a few hundred thousand pilgrims instead of one to two millions in the twelve-yearly Kumbh years.

## KUMBH HARDWAR FAIRS.

The conditions at one of these gatherings in 1867 have been graphically described as follows by Cutcliffe, the sanitary officer in charge.

“The bathing place of the pilgrims is 650 feet long by about 80 feet wide, shut off from the rest of the bed of the Ganges by rails. Into this long, narrow enclosure, the pilgrims from all parts of the encampment crowded as closely as possible from early morn until sunset. The water within this space was, during the whole of the time, thick and dirty, partly from the ashes of the dead brought by surviving relatives to be deposited in the waters of the river god, and partly from the washing of clothes and bodies of the bathers. Now pilgrims at the bathing ghat, after entering the water, dip themselves under water three or more times, and then drink the holy water whilst saying their prayers; the drinking of the water is never omitted. The quantity of water drunk by the bathers varies, but it is never less than about as much as can be taken up by the palms of two hands held together, so as to form a cup, and usually several cupfuls are drunk.”

When we remember that a large proportion of the million or two pilgrims come from the great Bengal United Provinces endemic area I have described, and travel long distances through it, it would be a miracle indeed if cholera did not appear among them, in spite of the elaborate sanitary arrangements made by the Government for the occasion, as occurred in 1867, regarding which Cutcliffe recorded that the health remained good until April 11, but on the evening of the 12th there were several undoubted cases of cholera, and on beginning to disperse on the morning of the 13th, "every section of the great multitude had become contaminated with cholera, and every one of the streams of returning pilgrims had cases of the disease within one day's journey of Hardwar, and it clung to them till their arrival in their homes in the most distant parts of the Province."

The spread of cholera over the Punjab by the 1867 Hardwar epidemic is described fully by Dr. Murray, I.-G. of Hospitals, and A. C. C. DeRenzy, the able sanitary commissioner, and it is recorded that "the pilgrim cases take precedence in every case, and, with few exceptions, the first cases among residents occurred in persons who had been in close contact with pilgrims. In no single instance did the disease appear in a station before the arrival of the pilgrims. The facts leave no doubt of the transmissibility of the disease and of the pilgrims being the vehicle of its importation into the Punjab." Again, "In thirty-five of the fifty-one districts the first persons attacked were pilgrims, and after they had been seized the disease appeared and spread among the residents." From the recorded data it appears that all the districts of the western part of the United Provinces and those of the Punjab, as far as Lahore and Multan—the limits of the Punjab railway at that date—were infected by Hardwar pilgrims within two weeks of the epidemic outbreak at Hardwar on April 13, and that in the absence of railways further west the disease then spread much more slowly along the main roads, this epidemic causing the highest mortality in the Punjab, except in the year 1892.

#### THE 1879 PUNJAB EPIDEMIC.

This also originated in an outbreak at the Kumbh Hardwar Fair, which recurred this year, in much the same way as in the last one in 1867 just described, the only difference being a slightly more rapid spread by the returning Punjab pilgrims, owing to the Saharanpur railway having in the meantime been connected with the Lahore-Multan line, and the latter having reached Jhelum. The spread by the pilgrims is fully traced in the Punjab Sanitary Report, and C. Planck, in the Sanitary Report of the United Provinces for 1879, gives a very detailed account of the Hardwar outbreak from personal observations on the spot, and proves that the disease was introduced by pilgrims from the Kumaun Hills—where it had been present from early in the year—who had cases on their journey to Hardwar, and in whose camp on the west of the Ganges at Hardwar Planck



found twenty cases. In spite of all precautions sixty-one cases with forty-two deaths occurred in their camp, and although on April 13, immediately after the great bathing day on the 12th, the pilgrims began to disperse, forty-two more cases were admitted from all parts of the Fair and from the towns of Hardwar and Kankal between April 11 and 14. Planck visited the pilgrim camps on the routes leading from Hardwar, and established the conclusive fact that in the four United Provinces districts around Hardwar, through which the pilgrim routes passed, all the dates of the first cases in different circles showed later dates in proportion to the distance by road from Hardwar; and in every district the only circles in which serious mortality occurred were those through which the main pilgrim routes passed: the details recorded leaving no doubt of the correctness of Planck's conclusion that this great cholera epidemic originated at the Hardwar Fair and was disseminated widely by the returning pilgrims.

The 1879 Punjab report gives invaluable and unique data of the number of pilgrims going to the Hardwar Fair that year from eighteen districts, amounting to a total of 52,491, no less than 1,065 of whom, or 19·54 per mille, died of cholera on the journey from Hardwar, or very shortly after their return to their villages, where they produced the epidemic with a mortality of 1·49 for the whole of the Punjab, then including the North-West Frontier Province. The significance of these figures will become apparent when I come to prophylaxis.

#### THE 1892 PUNJAB EPIDEMIC.

This was the next severe, and in fact the greatest of the Punjab epidemics, once more arising at Hardwar, but this time in an ordinary year, not a Kumbh one, which passed with only a slight excess of cholera in 1891 for the reasons already given. 1892 was, however, much more favourable than 1891 for the spread of cholera from Hardwar, on account of the unusual prevalence of the disease early in the year in the neighbouring Meerut and Kumaun Hills divisions, and of the high absolute humidity and previous low rainfall. Under these unfavourable conditions cholera broke out at Hardwar on March 22, when only 70,000 pilgrims had assembled, 200,000 on the way there being turned back. Drought, resulting in less fresh water and current in the bathing pool of the Ganges, more than counteracted the elaborate sanitary precautions, and "two sufferers in the last stage of cholera were taken out of the pool and died immediately afterwards," as had also occurred in 1879, the pilgrims all having to drink from this stagnant cholera-infected pool as part of their religious ceremonies. Moreover, I find from my absolute humidity tables that the average for April, 1892, was greatly in excess, in fact the second highest in thirty-three years, greatly favouring the rapid spread of cholera, instead of being well below normal, as in 1891, with little cholera. It is obvious that no sanitary precautions can possibly prevent a catastrophe under such a combination of unfavourable conditions, as long as masses of pilgrims, unprotected

against the disease, have to travel through an infected endemic area to such a place and to join in such a ceremony as that at the Hardwar bathing festivals.

By 1892, the railways of the Punjab had been extended to Peshawar and numerous branch lines constructed, with the result that the disease was spread more rapidly from Hardwar by the returning Punjab pilgrims than ever before, fourteen districts becoming infected, all by pilgrims returning from Hardwar in the last seven days of March and sixteen more by the end of April, the total cholera deaths in the Province in this disastrous year being 75,959.

The next important Punjab epidemic was in the famine year 1900, and was but part of the pandemic which swept over India that year. From this time on the provincial sanitary reports were so cut down by the orders of the Government of India that only the most meagre accounts of cholera have been made available. The Kumbh Hardwar year 1903 showed the usual spread of cholera by the returning pilgrims. The disease broke out at Hardwar on April 26, and was rapidly spread over the Western United Provinces, the Punjab and N.W. Frontier Province; 229 cases of cholera were reported in fifteen districts by the end of April, "and in every one of them the first case was that of a pilgrim returning from the Hardwar Fair."

In 1908 cholera was spread in the Western Punjab from an outbreak at a fair at Kitas, but in 1915 the Khumbh Hardwar Fair was again responsible for extensive infection of the Punjab through the retiring Punjab pilgrims, and it is recorded that "cholera broke out at once in twenty-three districts and caused 877 deaths during April, the victims being in most places those who had just returned from the great Hardwar Kumbh Fair. It may be noted here that no less than 2,017 cases, with 1,085 deaths, were due to infection introduced from Hardwar from the middle of April to the third week in May." Further, "no less than sixty-one persons were infected at Hardwar in the Kumbh Fair, and were the chief agents of importing infection into the districts."

The last Punjab epidemic in my chart was in 1921, after low rainfall, the Province being free from the disease up to the end of March, but in April nine districts were infected through importation, "the first deaths in practically all centres being those of persons infected at Hardwar," and the disease then spread widely through the Province. Thus the last, as the first, of the epidemics over a period of more than five decades began with a serious outbreak originating in pilgrims returning from the Hardwar Fair with cholera, and my chart (fig. 12) shows that in no less than sixteen of the twenty-three years from 1900-22 the Punjab sanitary reports record the importation of cholera into the Province by pilgrims returning from the Hardwar Fairs. This, therefore, is clearly the crucial fact which must be faced in any attempt to protect the Province in future from this justly dreaded disease.

## THE INVASION OF THE CENTRAL PROVINCES EPIDEMIC AREA.

The Central Provinces form the second great epidemic area, from which the disease not infrequently dies out, followed by re-invasion from outside, although this takes place from several directions, making the problem more complicated than in the Punjab just dealt with. The yearly cholera incidence in the Central Provinces shows extreme variations from nil or under 0.01 per mille in four years and not over 0.05 per mille in seven more years, up to from 6.95 to 7.84 per mille in three years, and to over 3.00 per mille in nine more years, but the epidemics occurred at quite irregular intervals. I worked out a table of the years of both very low and of very high incidence, including the variations from the average in each of the four divisions, and of three adjacent divisions of other Provinces, namely, Orissa to the east, Jhansi to the north, and the North Deccan to the west, together with the rates per mille of all India in the same years, and in the Central Provinces in the previous year or two. This brings out the following interesting points. In the first place, every year but two of low incidence in the Central Provinces showed low rates for the whole of India, and the two exceptions gave only average rates in India as a whole; while, on the contrary, every year of very high rates in the Central Provinces showed rates over the normal and usually very high rates in all India; showing that the Central Provinces rates are very closely related to those in surrounding Provinces. This is brought out still more clearly by an even closer relationship between low and high cholera respectively in the Central Provinces and in the three adjacent divisions just mentioned, from which the disease so frequently invades the Central Provinces. Once more the years of exceptionally high rates are characterized by exceptionally low previous autumn and winter rains, showing that this factor operates in this area as in practically every part of India. Thirdly, the years of very low cholera showed considerable excess in the previous year or two in the case of no less than fourteen of the sixteen low years, illustrating the considerable temporary immunity following epidemics of cholera in this area, an important factor which has already been referred to. All these factors must be taken into account in forecasting epidemics in the Central Provinces, as elsewhere. Low rainfall, for example, will fail to have much effect in increasing cholera if there has been a severe epidemic in the previous year.

## THE SPREAD OF CHOLERA IN THE CENTRAL PROVINCES.

In my full paper (which will appear shortly in the *Indian Journal of Medical Research*) I have traced the course of the epidemics in the Central Provinces to invasions from surrounding endemic areas of Orissa, the United Provinces, the Bombay coast and the North Deccan, but space will only allow me here to deal with the 1906 epidemic, illustrated in a map (fig. 13), from which it is clear that cholera invaded the eastern Chattisgarh division of the Central Provinces from the Puri pilgrimage in Orissa. The

northern Jubbulpore division was invaded from the Allahabad Fair; the north-west Nerbudda division from the Ujjain pilgrimage in Central India; and Berar was invaded by infected pilgrims from the Nasik and Pandarpur pilgrim centres in the Bombay Deccan, as well as from the Hyderabad State to the south: constituting a remarkable example of the invasion mainly by cholera-infected pilgrims from all sides of this centrally situated Province. The following quotation from the sanitary report of the Central Provinces for 1913, by Lieutenant-Colonel T. G. S. Stokes, I.M.S., will suffice to prove that 1906 was by no means an exceptional year: "As I think the facts about fairs cannot be too well known, it is worthy of note

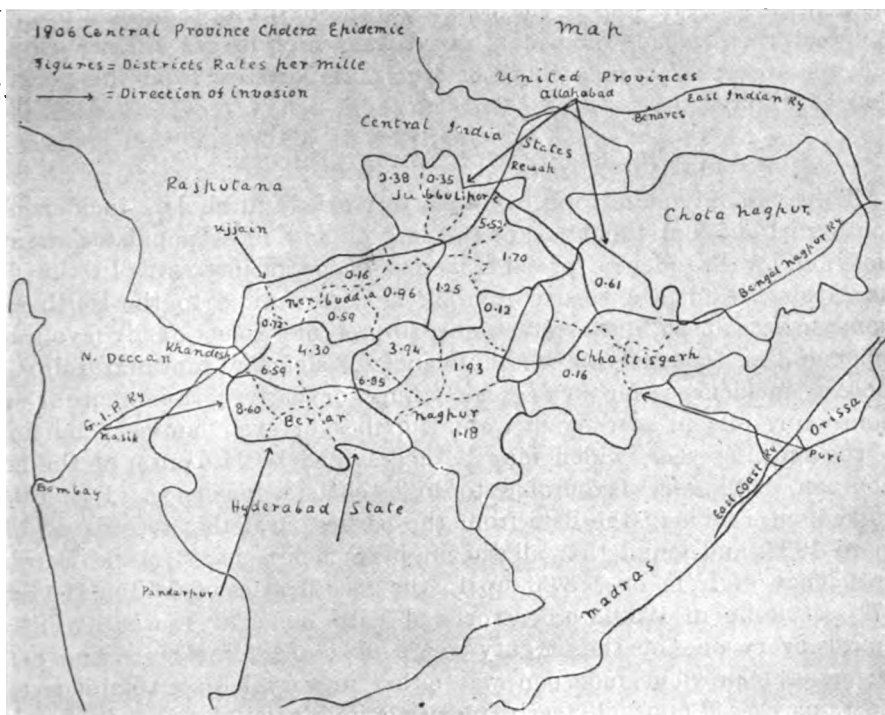


FIG. 13.

that only four times in the last forty-five years has the Province escaped cholera, and in the vast majority of cases these outbreaks have been traceable to fairs, e.g., epidemics have been traced 15 times (chiefly in recent years) to Jaganath Puri, 8 times to Allahabad, 6 times to Pandarpur and 13 times (which, with the exception of the present instance, were all previous to 1897), to small provincial fairs. From these facts it is evident that we have to fear the pilgrims from outside the Province most, but our small provincial fairs are by no means devoid of danger." The increased frequency of outbreaks due to Puri pilgrims is due to opening up of direct railway communications from Puri through the Central Provinces, and now

that the Government of India has given a substantial grant to supply good water to Puri, the greatest cholera plague spot in India, it is to be hoped that this danger will be minimized to some degree.

It is sufficiently clear from this brief account that pilgrims and fairs are the main agencies in spreading cholera over the Central Provinces from surrounding areas, and this Province, unlike the Punjab, has a considerable through traffic of pilgrims from other Provinces, although the construction of railways has this advantage, that the pilgrims are rapidly conveyed through the Province, instead of marching slowly, with consequent infection of the areas they traversed. Cases on the railways are treated in railway hospitals, and are unable to infect the villages; so the essential danger to the Central Provinces, as in the Punjab, is the return of their own pilgrims to infect their village homes after visiting pilgrimages in the cholera endemic areas; a fact once more of crucial importance from the point of view of prophylaxis.

#### CHOLERA IN THE BOMBAY DECCAN.

Time will only permit me to allude very briefly to cholera incidence in Southern India, but the Deccan, the largest and most populated area of the Bombay Presidency, presents points of great interest. In the first place this area has a scanty rainfall, almost limited to the south-west monsoon season, with no winter rains, so presents exceptionally favourable opportunities for studying the influence of deficient autumn rains on cholera incidence; for any great failure or early termination of the monsoon results in scarcity of water supplies, or even famine conditions, in the ensuing year, which may be aggravated by late onset of the next monsoon, both very favourable to high cholera incidence. I therefore worked out a table of the data from the earliest available records of 1865 up to 1922, and found that all the highest cholera rates in the Bombay Presidency of from over 3·00 up to the record rates of 7·52 in 1865 and 8·71 per mille in 1900 were associated with deficient rainfall, while in almost every one of the twenty years of cholera incidence above the average the previous monsoon was either in very definite total defect, or the rains ceased unusually early, resulting in great deficiency in the last two or three months of the monsoon, sometimes in spite of a total excess for the whole monsoon period, with consequent failure of the water supplies in the first half of the following year. This was sometimes accentuated by late onset of the monsoon of the same year, the epidemics always starting in the rainless spring, when the water supplies are at their worst.

It is important to inquire if there are any exceptions to this general rule, and I found the only definite exception was a record deficiency of forty inches out of an average of seventy-two at Bombay in 1904, followed by a low cholera rate in 1905, but a further great deficiency of the 1905 monsoon was closely followed by a severe epidemic in the spring of 1906. On examining my yearly maps of cholera incidence in the forty-five

divisions of India, the reason for the low cholera rate in 1905, in spite of previous low rainfall, became apparent, for that year showed the most exceptionally low rate of 0·85 per mille for all India, and all the areas adjacent to Bombay were nearly or completely free from cholera that year, so that there were no neighbouring foci from which the Province could be invaded; proving once more the necessity of taking all the factors into account in forecasting epidemics in any area, including the degree of infection of adjacent ones.

*Pilgrimages* play an important part once more in disseminating cholera in the Bombay Deccan more especially. Pandarpur, in the Sholapur district, having two large festivals, one in July during the height of the cholera season, which always spreads cholera when there is any in the neighbourhood, and another in April, which only occasionally produces epidemics, the reason for which I found to be that it is only in years of exceptionally high absolute humidity at that season, favouring the incidence of cholera, that epidemics arise as early as the April Fair; yet another instructive instance of the importance of watching this factor in forecasting epidemics. The other great pilgrim centre in Bombay is at Nasik, the twelve-yearly Sinhast Fair, lasting for a year, being closely associated with cholera epidemics in this Presidency. This will be shown in my full paper, but I only have time to mention here the very puzzling localized epidemic in the North Deccan in 1909, with low cholera in all the adjacent areas. and in India as a whole, which I could not understand until I found it was due to spread by the Nasik Sinhast Fair of that year.

#### CHOLERA INCIDENCE IN MADRAS.

Here we have complicated conditions with the main rainfall of different portions of the northern part of the Presidency derived from either the Bengal or the Bombay south-west monsoon currents, and in south-east Madras from the autumn north-east monsoon, with irregular overlapping. Nevertheless, I have given data in my full paper to show a close relationship between failure of one or other of these currents and subsequent increased cholera in the corresponding area; once more in accordance with the general rule, although forecasting outbreaks in Madras is especially complicated. *Pilgrimages* also play their usual part.

#### CHOLERA INCIDENCE IN LOWER BURMA.

Here we have an isolated area, where the absolute humidity never falls low enough to affect materially the seasonal incidence or epidemic prevalence, and the annual rainfall averages about 100 inches, failures of the rains and famines being unknown, as in Assam. Nevertheless, I have found the closest relationship between early termination of the monsoon and subsequent increased cholera incidence, confirming the essential importance of this factor yet again, and allowing the epidemics, never very

severe in this area, to be foreseen. When cholera is most prevalent in Lower Burma, Upper Burma is commonly involved.

#### PROPHYLACTIC MEASURES AGAINST CHOLERA EPIDEMICS.

I have now concluded the summary of the evidence I have given in my full paper regarding the causation and forecasting of epidemics of cholera in India, and it only remains to consider very briefly the possibility of controlling to some extent the spread of the disease. Much has already been done to diminish cholera in some large towns by providing good water supplies. It is, however, generally recognized that it will take centuries to improve village sanitation to the extent necessary to reduce materially the prevalence of this disease in India, so we must seek for more rapid methods of control. Now, the one great outstanding factor in the spread of cholera, which can be controlled, is the movement of the twenty million pilgrims yearly in India, mostly through infected endemic areas, for we cannot influence the favouring effects of deficient rainfall, although we can watch it and be forewarned several months ahead of the danger of increased cholera in different areas following diminished autumn and winter rains, and we can also watch the daily and monthly absolute humidity in each Province, so as to know when it rises to a point favouring the spread of the disease in each area, and consequently we can foresee when the journeys of the pilgrims traversing any given area at any given time of the year are likely to be especially dangerous, making it highly desirable to protect the pilgrims and other travellers through such localities.

#### THE HIGH PROTECTIVE VALUE OF ANTICHOLERA INOCULATION.

Fortunately we have in our hands a simple and effective measure for affording the necessary protection in anticholera inoculation, a milder procedure than antiplague vaccine, and one which is so efficient that in six epidemics totalling over 500,000 persons tabulated in my book on "Bowel Diseases in the Tropics," the cholera incidence among these inoculated twice at from seven to ten days' interval was reduced by 93 to 97 per cent, as compared with the uninoculated in the same places at the same times, but with a single injection the reduction amounted to from 55 to 73 per cent only. Further, the procedure has recently been improved, for in Tokio, in Japan, by the use of a sensitized cholera vaccine, a reduction of 96 per cent in the incidence of cholera was produced in several hundred thousand persons without any negative phase or severe reactions, and the true reduction was 100 per cent, as the only three inoculated who were attacked did not receive the second dose. Once more, Besredka, of the Paris Pasteur Institute, has introduced an oral anticholera vaccine which does away with the necessity even of injecting the people, but this method requires careful trial before it can be decided whether it is anything like as efficient as inoculation, so the latter should be relied on at the present time.

## THE INOCULATION OF PILGRIMS BEFORE STARTING ON PILGRIMAGES TO DANGEROUS ENDEMIC AREAS.

Once cholera has broken out among pilgrims it is too late for inoculation, and only locking the stable door after the horse has been stolen, as it is essential to disperse the pilgrims as rapidly as possible. Here comes in the significance of the 20 per mille death-rate from cholera among over 50,000 pilgrims from eighteen Punjab districts attending the Kumbh Hardwar Fair in 1879, as it is clear that if these pilgrims could have been inoculated against cholera *before* starting on their dangerous journey, the high mortality among them could have been nearly entirely prevented, and, far more important, the widespread Punjab epidemic, with 26,135 cholera deaths, produced by their return with the disease, could have been very largely prevented. The numbers to be inoculated in any one district, even in the Kumbh year, would only have been a very few thousand, and every dispensary in each district could be utilized for the purpose with a little organization. Moreover, as the breaking up of pilgrimages on the outbreak of cholera is very inimical to the interests of the Hindu priests, the Government should be able to obtain their cordial assistance in carrying out this simple and harmless method, while the powers we now possess of foreseeing the most severe epidemics will enable the measure to be applied where most wanted.

It is in the *epidemic areas* of the Punjab and Central Provinces that this plan is most essential, for we have seen that they owe their epidemics essentially to *their own pilgrims* visiting cholera endemic areas and bringing back the disease with them. They have, therefore, the remedy in their own hands, if only they will make use of it. The protection of the Punjab is easiest, as nearly all the cholera is brought by the Hardwar pilgrims, and it is also of the greatest importance, since if this Province can be protected against cholera epidemics, as I believe to be the case, the still very dangerous overland route through Afghanistan to south-east Europe will also be safeguarded. The Central Provinces, open to invasion by pilgrims on nearly all sides, presents a more difficult, but by no means insoluble problem, and Sind, Gujarat, and the Bombay Deccan can make use of the same measure for their own protection. Each Local Government should watch the cholera position, rainfall, and absolute humidity from day to day through charts kept in the offices of the Directors of Public Health, and as soon as it becomes evident that attendance at any pilgrimage or fair is likely to spread cholera, the Government should issue proclamations forbidding any pilgrims to leave their districts for the fairs until they have received the double inoculation at the nearest dispensary, certificates being provided for them with their thumb impressions on them for identification. The people will very soon learn the value of the procedure, while the known value of antiplague inoculation will make the suggested measure far easier to carry out than three decades ago.



In *endemic areas* the problem is a more difficult one, but the principles are the same, and no one should be allowed to attend the great fairs at Puri, Allahabad, Hardwar, etc., in the endemic areas in any year without being first inoculated against cholera, although doubtless this measure will have to be introduced gradually in difficult areas, and extended as its benefits become evident. Only when it becomes as common for persons to be inoculated against cholera before undertaking the dangerous journey through a cholera-infected part, including all the endemic areas in the cholera seasons, as it is to be vaccinated against small-pox before visiting a place in which that disease is epidemic, shall we begin to control the incidence of this terrible and dreaded disease.

Finally, I wish to point out that 1927 is a Kumbh Hardwar Fair year, and although the good monsoon of last year may lessen the danger of the most serious class of epidemic resulting from it, yet it is too much to expect the recurrence of such favourable absolute humidity conditions as served to check the Hardwar outbreak in 1891. Every one of the other Hardwar Kumbh Fairs since 1867 has resulted in cholera epidemics, in the western United Provinces and the Punjab, and I earnestly appeal to the administrative and sanitary authorities in those Provinces to lose no time in protecting the pilgrims by anticholera inoculation in their districts before they are allowed to proceed on their very perilous journey to Hardwar in this Kumbh Fair year. An opportunity now presents itself to test in a crucial manner the simple remedy I have suggested, and one as to which Lieutenant-Colonel C. A. Gill, I.M.S., Director of Public Health in the Punjab, after hearing my first paper before the Royal Society of Medicine last March, putting forward this proposal, wrote to me that he considered it to be a valuable and feasible plan. If this opportunity is allowed to slip and the usual many thousand cholera deaths of a Kumbh Hardwar Fair result once more in the Western United Provinces and the Punjab, with the additional danger of a pandemic spreading to Europe, it will not be for a want of warning, and a heavy responsibility will devolve on any who may neglect it.

The illustrations are reproduced from my paper in the *Proceedings of the Royal Society of Medicine*, 1926, vol. xix, "Section of Epidemiology and State Medicine," pp. 59-91, by kind permission of that Society.



## Editorial.

### PROPHYLACTIC VACCINATION OF THE NEWLY-BORN AGAINST TUBERCULOSIS.

For some years before the war Professors Calmette and Guérin had been endeavouring to discover a method of cultivation by which tubercle bacilli would lose their virulence and yet retain their immunizing power when injected as a vaccine. The work was interrupted by the war, but in 1920 they published a full report, from which it appeared that their object had been attained by cultivating tubercle bacilli on a potato medium treated with glycerine and ox-bile. After 230 successive subcultures during thirteen years the bacilli became so attenuated that they could be injected in large doses in the living state into mammals without giving rise to disease.

Experiments on monkeys showed that these animals when vaccinated with the attenuated strain "B.C.G." (Bacille Calmette-Guérin), remained well after living for long periods side by side with non-vaccinated and infected monkeys. In view of the known susceptibility of the monkey to tuberculosis this result was of great importance, and Calmette felt justified in trying the method on infants who were being brought up by tuberculous parents. The first human being to be vaccinated was an infant obliged to live with a tuberculous grandmother. Three doses were given by the mouth at intervals of a few days; no ill-effects were observed, and the child remained in perfect health. Since then numerous infants born of tuberculous parents have been vaccinated, the vaccine being given by the mouth in three doses of 10 mg. during the first ten days of life. The results obtained are reported by Calmette in the *Annales de l'Institut Pasteur* for March, 1927.

Before discussing the figures he recalls briefly the experimental facts and the principles upon which the actual prevention by the B.C.G. vaccine is based. As a result of the work carried out since 1906, Calmette and his collaborators conclude that an animal which ingests in one dose or in one meal a small quantity of virulent finely divided tubercle bacilli contracts tubercle, either pulmonary or glandular, or possibly pulmonary and glandular at the same time. The animal reacts to tuberculin for one or two months, sometimes longer, and may get quite well. Animals thus cured are no longer susceptible, at least during a certain time, of being re-infected, although they may take in a considerable quantity of virulent bacilli.

On the other hand, animals which are subjected to several re-infections by the digestive tube, repeated at short intervals, are never cured. Their lesions become intensified and rapidly pass to caseation. In view of the failures by other observers to obtain an anti-tubercular immunity, either by tuberculins or with different bacillary extracts, or with dried bacilli, or

living bacilli spontaneously attenuated, and from varying sources, Calmette and Guérin directed their researches towards obtaining resistance to re-infection by the impregnation as early as possible of the whole lymphatic system of the organism with living tubercle bacilli deprived of virulence. In the hope of attaining their object they experimented in the first place with living bacilli of equine origin, feebly tuberculogenic and almost deprived of virulence for the guinea-pig. But the employment of these germs presented dangers analogous to those resulting from attenuated human bacilli, which Behring used as *bovo-vaccin*. They then tried to create a race of tubercle bacilli which was really deprived of virulence for all kinds of animals, and which could be used as a vaccine and whose characters were hereditarily fixed. After many failures they found in ox-bile, glycerinated to the extent of 5 per cent, a medium which, in spite of its great alkalinity, permitted the growth of the tubercle bacillus on potato and modified not only its appearance, which became similar to cultures of glanders, but also its virulence to such a degree that after thirty reinoculations, effected every twenty-four hours on this medium, a bovine bacillus, originally very virulent, became almost innocuous for the guinea-pig and calf. Continuing their successive cultures they have been able to convince themselves, at the end of thirteen years, and after 230 passages on bile media that their bacillus, even when injected in large doses and fine emulsions into the veins and into the peritoneum of laboratory rodents, guinea-pigs or rabbits, is perfectly inoffensive, and does not produce tubercles. It, however, remains an excellent antigen, capable of provoking the formation of large quantities of antibody in the organism of healthy animals, and above all in tubercular animals. On the usual culture media, where it regains the normal appearance of Koch's bacillus, it remains an active producer of tuberculin.

Experiments on young cattle, and later on monkeys, showed very soon that these "biliated" bacilli, B.C.G., were deprived of virulence and, when absorbed by the digestive canal, or when given subcutaneously or intravenously, conferred on animals without the least danger the same state of resistance towards re-infection that a slight virulent infection produces.

Having shown that the passage of tubercle bacilli across the wall of the small intestine is normally effected very easily in the quite young, above all during the days which follow birth, Calmette and Guérin resolved to take advantage of this brief period to obtain protection amongst young animals by making them absorb a suitable quantity of B.C.G. by the mouth.

In order to study the effects of B.C.G. on new-born infants, Calmette desired to obtain precise information as to the mortality from tuberculosis of children up to 1 year of age in families apparently healthy and in families where one or more members suffered from tuberculosis. Official statistics were not obtainable, as tuberculosis is not notifiable in France.

Inquiries were therefore made at local dispensaries, of which there are more than 500 in France; the results showed that 24 per cent of children up to 1 year of age living in infected households died from affections presumably tuberculous. In Paris the figures were higher—32·6 per cent. But when the infection was acquired between the first and second years of life, the risk of death was only 1·66 per cent. After the second year of life the infection appears more chronic, and is generally localized to the glands and joints. Calmette states that, taking the lowest figures of the dispensaries controlled by the National Committee of Defence against tuberculosis, at least 25 per cent of children born of tuberculous mothers or brought up in infected households succumb to a tuberculous infection during the first year of life. Calmette and Guérin believe that many of the children, born of tuberculous mothers, who die in the first week of life of debility without showing any signs of tubercular disease, are the victims of an infection due to the passage of a tubercular ultra-virus through the placenta during gestation. This ultra-virus will pass through porcelain filters, and when injected into female guinea-pigs infects the foetus and produces tubercular lesions, in which are found normal acid-resisting tubercle bacilli.

The innocuousness of B.C.G. having been established, the Pasteur Institute, from July 1, 1924, placed the new vaccine at the disposal of practitioners for the protection of infants born of tuberculous mothers or exposed to infection in the home. Statistics covering two and a half years are now available, and have been studied by M. Moine. From July 1, 1924, up to January 1, 1927, 21,200 children have been vaccinated with B.C.G. But M. Moine has taken into consideration only those vaccinated infants more than 1 year old born of tubercular mothers or brought up in a definitely infected family, as these alone can be strictly compared with an equal number of infants born and brought up in similar conditions, but *not* vaccinated. In the former category there were 882 children who had been vaccinated for a period of one to two years; of these 7 died from tuberculous lesions and 72 from non-tuberculous lesions. The mortality from tuberculosis, therefore, was 0·79 per cent, and from all causes 8·9 per cent. Amongst the deaths from non-tubercular maladies in the vaccinated children the cause was not specified in thirty-one cases. Even if these deaths were attributed to tubercle, the mortality from tubercle for the whole of the children exposed to infection would be only 3·9 per cent, as compared with a rate of 24 per cent for unvaccinated children in the same category.

Dr. Biraud furnished a report on 1,537 infants brought up in a tuberculous environment, and who had been vaccinated during the years 1924 to 1926; of these 1,050 had been in contact with tuberculous people and 487 in contact with tuberculous mothers. The general mortality from all causes in the two groups during the first year of life was 7·6 per cent and 6·6 per cent, while the mortality from tuberculosis during the first year of

life was 1.55 per cent and 2.46 per cent. According to Calmette a comparison of the mortality of vaccinated and unvaccinated children in contact with tuberculous mothers brought out striking results; the rate for the former was 6.6 per cent and that for the latter 24 per cent. The gain from the point of view of mortality among the vaccinated appeared to be due to the elimination of deaths from tuberculosis. These figures were obtained by means of an inquiry carried out in the French dispensaries; presumably the two groups were under similar supervision, and therefore comparable.

The mortality rates given by Calmette do not apply to all countries. Statistics collected in Denmark by R. Kjer-Petersen and J. Ostenfeld seem to show that in the period 1890-94 the death-rate of infants under 1 year living in tuberculous homes was 6.2 per cent and in the period 1920-24 the death-rate was only 1.6 per cent.

Bergman, of Upsala, came to the conclusion that when both parents are tuberculous the death-rate of their infants under 1 year of age from tuberculosis is 9.6 per cent, and when only one is tuberculous it is 5.2 per cent.

Dr. Major Greenwood has examined Dr. Biraud's data, and considers that the mortality in the first year of life of the vaccinated children is no worse than that of ordinary children. Hence, if it could be shown that the rate of mortality of children of the class living in tuberculous homes is very much worse than the average, a *prima facie* case in favour of the process would have been made out, but only a *prima facie* case, as the data are scanty.

The ideal experiment for testing Professor Calmette's results would be the supervision of equal numbers of two groups of infants of the same age and living under similar conditions. To one group the B.C.G. vaccine would be administered, the other group would serve as a control. To make the experiment complete, it would be necessary to make a post-mortem examination on every child that died during the first year of life. Even without the examination, if a difference of mortality such as that recorded by Calmette were observed, it would be a strong point in favour of his prophylactic system.

In conclusion, it may be said that as far as laboratory observations can go, Calmette and Guérin have produced in B.C.G. an immunizing substance which is effective and can be used without risk. They have indicated the way in which they think it could be most usefully employed in the prevention of human tuberculosis, and have shown that its administration in this way has not, at any rate, been harmful.

Calmette has failed, so far, to produce quite conclusive evidence of the prophylactic action of B.C.G., but, no doubt, careful collection of statistics will in time clear up this point. It is greatly to be hoped that the desired effect will be found to have been achieved, for the administration of B.C.G. in no way interferes with the natural acquisition of immunity, which is our real bulwark against the ravages of the disease.

## Clinical and other Notes.

### THE CALIPER SPLINT.

By MAJOR C. CLARKE, D.S.O., M.B., F.R.C.S.

*Royal Army Medical Corps.*

THE value of the Thomas's knee splint in the treatment of fractures of the lower limb was so thoroughly established by the experience of surgeons in the Great War that there is no need to emphasize the fact to-day.

This splint is of the greatest value in the early treatment of fractures, for the extension overcomes shortening and muscular contraction, and the suspension of the limb aids the absorption of traumatic effusions.

After the first three weeks or month of treatment soft union of the fractured bones take place. Immobilization and suspension of the limb after this stage tend to delay bony union by diminishing the blood supply of the limb.

The patient also suffers both mentally and physically from confinement to bed, and makes a much more rapid recovery if he is allowed to be up and walking about.

The caliper walking splint is as valuable in the second phase of fracture treatment as the Thomas's knee splint is in the first or bed stage of treatment.

To be successful, however, a caliper splint must fit the patient's limb well. The thigh ring should be a comfortable fit over the patient's pants, and this can only be obtained by trying on various rings as one would select a suitable pair of boots.

The length of the splint must be exactly right, for if too long there will be painful pressure on the tuber ischii, and if too short, bending or telescoping at the site of fracture will take place.

The making and fitting of a caliper splint should be done under the direct supervision of the surgeon, as it requires more accuracy of measurement than the fitting of a patient with a truss for hernia.

The caliper splint benders depicted in the accompanying illustration enable the surgeon to make caliper splints from ordinary Thomas's knee splints.

All the tools required for this purpose are : (1) a metal hacksaw ; (2) a file ; (3) a pair of caliper benders.

The width of the caliper benders is exactly two inches and corresponds to the length of the turned-in claw of the caliper splint.

The procedure for making a caliper splint from a Thomas's knee splint is as follows :—

The selected splint is fitted over the limb until the ring rests on the tuber ischii. The prepared boot is then put on the patient's foot.

With the foot at a right angle and the heel well home in the boot, a point on each side iron is marked with a file, to correspond with the lower edge of the caliper socket in the boot heel.

The splint is then removed, and each side iron is sawn through with a hacksaw at a point two inches below the file mark.

The two cut ends of the side irons are then inserted into the red, glowing coals of an ordinary fire.

When the two ends are red hot, the splint is placed on a wooden chair, the two red-hot ends being well away from the seat of the chair.



FIG. 1.—Caliper bender—side view.



FIG. 2.—Caliper bender—plan view.

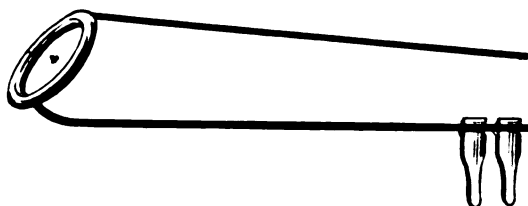


FIG. 3.—Benders in position.

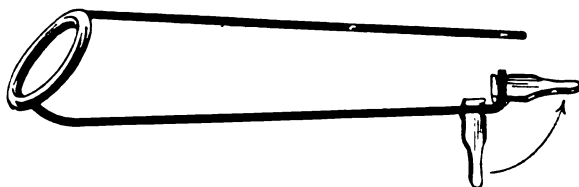


FIG. 4.—Caliper claw turned.

Caliper claw bending on cut Thomas's splint.

Each heated end is then gripped in turn with a pair of caliper benders, and the two-inch right angle turn made. The turn should be made in each case with the right hand, while the left grips and steadies the side iron above the bend.

To retain the right hand movement the splint is turned over on the chair after the first claw has been made.

Very little practice is required to become dexterous in the manœuvre, and there is no need to look for the file mark on the side iron, as the width of the bender exactly corresponds to the length of the claw.

In order to prepare a boot for the caliper splint, the layers of leather on the heel are removed down to the base layer, and a short piece of brass or iron tubing is then fixed to the heel base with a central fixation pin or nail.

The metal tube is placed across the heel in an oblique position, making an angle of fifteen degrees with the transverse line of the heel (*vide* lines C D and E F, fig. 5).

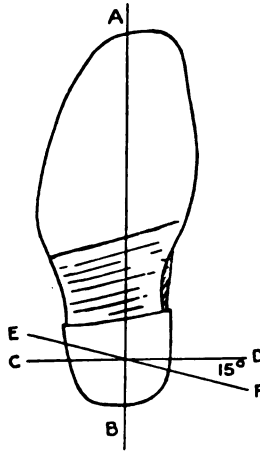


FIG. 5.—A B = Antero-posterior line of foot. C D = Transverse line of heel.  
E F = Oblique position of socket tube in heel.

This obliquity of the tube turns the foot outwards fifteen degrees, the two feet in walking being naturally turned outwards to this extent on each side of a medial antero-posterior line.

#### THE PREPARATION OF A BOOT FOR A CALIPER SPLINT.

By MR. C. BERRIDGE, *Master Shoemaker, Royal Victoria Hospital, Netley.*

To prepare a boot for a caliper splint, proceed as follows :—

(1) Remove the whole of the lifts of the heel down to the base of the heel.

(2) Take a piece of metal tubing three-eighths of an inch internal bore and cut off with a file a length corresponding to the width of the heel at its base.

(3) Drill a hole through the middle of this tube, to take a small holding screw.

(4) Groove the seat of the heel to receive the metal tube. The tube to lie in the groove so that its outer end is three-quarters of an inch behind the outer corner of the heel, and the inner end one and a half inches behind the inner corner of the heel (see line E F, fig. 5).

(5) Fix the tube in this position with a short screw in the hole drilled in the centre.



(6) Rebuild the heel in front and behind the tube up to the level of the caliper tube. After this use full-sized lifts till the heel is built up to the height required (see fig. 6).

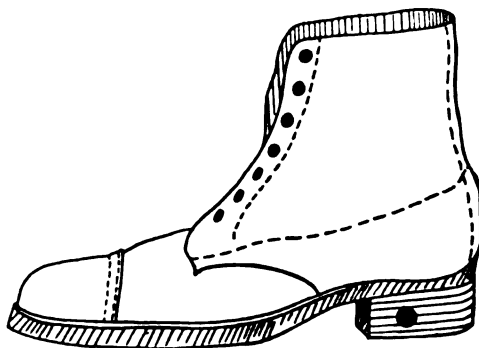


FIG. 6. - Position of the socket on the outer side of the heel  $\frac{3}{4}$  in. behind the outer corner.

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### THE TAIL-LESS TROOPER.

BY MAJOR C. S. P. HAMILTON, D.S.O.  
*Royal Army Medical Corps.*

It is refreshing to find still one or two practical minded, common-sense doctors in our midst. We are all so scientific that ordinary horse sense seems fading into mere oblivion. Here is a practical tip given to me by an experienced Colonel in the I.M.S., himself both an expert surgeon and horseman. I asked him how to cure saddle sores, impetigo of buttocks, and buttock boils amongst mounted units. His answer was not autogenous vaccines, eusol, hydrarg. perchlor., spirit, ointments, violet rays or flavine, not even scraping or free incisions. He merely said "My boy, cut off the tail of your shirt." This was tried, and after three years' experience I have never found it to fail. In hot climates the shirt is a constant source of irritation to those who have to be in the saddle for many hours; those who don't believe should try it. Yet another grave army disability is overcome. I don't know what the Ordnance will think about it.

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### AS OTHERS SEE US.

BY I. M. S.

CONFIDENTIAL reports are one of the trials of the Service. They try those that give and those that receive, but there is a humorous side even to this exacting duty. The writer's own case may serve as a text on which to hang a short sermon to his brother officers, especially the juniors, on the subject of *Æquanimitas*, or the sense of proportion in relation to their own merits.

After seven years' exemplary service he slipped up in one and the same

year over : (a) A surgical case, and (b) a constipated commanding officer, and was reported as unfit for promotion. The surgical mishap was due to a grave error of professional judgment on his part, and his condemnation was just. Item (b) terminated in a slightly excessive dose of croton oil to the affected individual, and the adverse comments were conceivably due to this therapeutic misadventure. However, time rolled on and the C.O. in question retired after a mediocre career, while the victim of the report slowly climbed up the tree. The annual confidential reports slowly improved until the writer had again achieved grace and was considered fit for promotion. On one occasion his charger bolted on parade at the General's inspection, and it was a little cruel of the C.O. to make the entry "Horsemanship dashing" in the confidential report for that year.

While on compulsory civil duty, the civilian head of the department wrote quite a nice D.O. chit to the Powers that Be commending the writer's work. Unfortunately the chit began : "Behind a somewhat forbidding exterior and brusque manner. . . ." Even the lowliest among us likes to be considered beautiful even if he is not virtuous, and this frank statement of one's physical shortcomings certainly led to the spirit of humbleness it was presumably intended to produce.

Now for the threatened sermon ! There is of late years an increasing tendency on the part of those reported on to take exception to any remarks that are not flattering. The following points are presented for consideration by all those who are reported on :—

Falstaff defines mankind as "that strangely compounded clay," and in drawing a picture of this clay both lights and shadows must be represented. None of us are perfect, the character of every human being contains varying proportions of light and shade. When therefore objection to such a character sketch is taken on the grounds that : "This is the first time in twenty-five years that an adverse remark has been made in my reports," the objector lays himself open to the fair retort that either he must consider himself faultless—which, as our friend Euclid justly observes, is absurd—or that the previous twenty-four reports have been more flattering than accurate.

The reportee should also remember that after four-and-twenty years' service a man's character has often changed ; the dashing self-reliant subaltern of 25 may have turned into the cautious field officer of 49, whose idea of the Game of Life is to play for safety. Again, it sometimes happens that the reportee gravely states that the one unfavourable comment damns, has damned or will damn the rest of his career in the Service. One such, whose nationality wild horses will not make me reveal, stated in the course of a two-page protest that he was "condemned to labour throughout succeeding life under indelible stigma of averageness." Anybody with average common sense and knowledge of the Service knows that as a rule a single adverse comment cannot damn.

If anyone be in affliction over his report he should avoid, like the plague,

any tendency to submit a report on himself. Buggins' opinion of himself may or may not be interesting, but other people's opinion of Buggins is what we want to know.

Finally, the acceptance of adversity in a philosophical and soldierly spirit is in itself a most attractive virtue, and not unfrequently the exhibition of this soldierly trait more than counterbalances any unfavourable comment that the report may have contained. The world has not much use for the whiner. Deeds are greater than words, and the stout fellow cannot but make good in the long run. This fact was well illustrated by a minister who took as his text: "The Lor-rd spake unto the fush, and the wha-ale voamited Jonah upon the dry land. Jonah, the second chapter and the tenth vaise." He preached at length on Justification by Deeds, and ended up with "And thus you see, my bretheren, that nothing can keep dune a really guid man, not even a wha-ale."

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## Travel.

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### L'OISEAU ROUGE.

By U. P. A.

(*Continued from p. 226.*)

#### IV.—OFF TO THE HILLS (*concluded*).

ON the morning of the twenty-second day out The Hop rose to the occasion. He appeared with *chhota haziri* half an hour earlier than usual.

And to be sure a first visit to Simla is, in truth, An Occasion.

Simla The Omnipotent; The Dispenser, The Appraiser, The Executioner!

Do you know what it is to feel a thrill, a real thrill? not a paltry Gallic *frisson*, nor a gross Teutonic goose-skin, but the boyish British thrill which is met with on the threshold of the unknown?

Rider Haggard's hero felt it when he first set eyes on "She."

The Hop felt it when he made his *début* in the trenches before Givenchy. The only occasion on which he casts his customary stolidity is when he talks of that.

Georgina and I felt it as L'Oiseau Rouge cleared Ambala and headed for Simla Pahar.

Bound for the fountain-head of circulars and the destination of Annual Confidential Reports; the source of Kaiser-i-Hinds and the birthplace of the magic symbol "P.A."; the mainspring of ambition and hope; the dealer of disappointment and, mayhap, of despair.

Thus we ruminate as L'Oiseau Rouge ploughs a prosaic path across a broad, dry river-bed where there is heavy going in deep sand.

Some day an engineer will build a bridge there. Meanwhile there are no funds. But some day . . . after H. E. or the C.-in-C. has been washed away by a sudden flood from the mountains.

Follows flat, scrub country with small clumps of trees here and there. Then a gradual rise and, at the thirty-eighth mile, the picturesque old fort which guards the entrance to Kalka village is passed.

Kalka is the plain terminus of the Simla Railway. This railway is a fine piece of engineering; in itself it is a Monument of Thanksgiving on behalf of the tonga ponies of the Punjab.

At this point the road is lined with bazars, rises suddenly and steeply and, at its worst part, forks.

We took the wrong fork and had to pull up, back, turn and start again; a bad beginning for a still worse gradient.

All roads which ascend the southern slopes of the Himalayas have points in common. They are wonderful examples of road-making; the mountain scenery is grand and the views are magnificent—the immense plains gradually losing colour and form in the heat haze; the everlasting, silent snows clear-cut against the azure sky; the quaint little terraced fields and the highland villages, people and animals.

From Almora to the Tochi all more or less alike, and quite different from the roads far below which you were traversing but a short hour since.

But, as is befitting, the Simla Road has a special feature of its own, inasmuch as it is guaranteed to make the steadiest head dizzy.

You climb a long, straight stretch to the edge of the world. Instead of leaping over into space you execute an innumerable number of pagalgymkhana movements; loops, S's, 8's, curves r., curves l., switchbacks, hairpins, mazes, angles \, L and <, till the brain reels and the car seems to be travelling in every kind of way except bonnet first.

Georgina exclaimed, "Look—what a view!" I saw a boulder. Or, "See those gorgeous rhododendrons!" I saw a fearsome gorge. We lost touch and sympathy because we could never see the same thing at the same moment. When I was piloting a sharp wheel to the left Georgina was completing an acute turn to the right, and The Hop was still in the middle of a loop ten yards back.

It was very disturbing.

Another long, straight gradient, and the acrobatics are repeated; in fact they're repeated 116 times; once every half-mile.

I was once in the care of a horrible fellow who took me up in a 'plane and brought me down in a spin. The result was acute vertigo.

The Simla Road produces the subacute variety.

Other Himalayan roads behave in the same sort of way; but the point is that their jigsaw-corkscrew sectors are neither so frequent nor so crowded.

It was a grand drive, but—yes—we were all tired at the end of it.

I patted *L'Oiseau Rouge* on the bonnet, once. It was too hot for a second pat.

I should like to have offered her a lump of sugar. Perhaps she guessed, and felt grateful, somewhere down about the big end, I suppose.

It is impossible to admit that the things on which a man expends so much of his affections—his golf sticks, fishing rods and automobiles—are entirely lacking in understanding.

We stayed in Simla for three days.

The short description of Simla which follows has been compiled with a view to supplementing the usual information contained in the guide-books.

(a) *History*.—Simla was discovered by Rudyard Kipling in the same way as Ipswich was brought to light by Charles Dickens.

There are finer malls than the Simla Mall and better inns than the Blue Boar; but Mrs. Hawksbee frequented the one and Mr. Pickwick the other, and that's enough.

This shows the importance of the human touch; where it is neglected disaster must follow.

The Florida Land Boom was run on modern business and advertising lines. It was boosted by skilled publicity agents from strictly utilitarian platforms. Had it been written up first by a Winston Churchill or a Mark Twain on the lines of "Richard Carvel" or "The Royal Nonesuch" it would still be booming as merrily as Simla itself.

(b) *Geography*.—The summer capital is bounded on the north by Annandale, Wildflower Hall and the golf course. On the south by the railway station, and by a dump of kerosene tins and match-boarding, in the depths of which most of the jhampanis live. On the east by Jakko, Little Simla and Thacker Spink's bookshop. On the west by Viceregal Lodge and the palaces of the Heaven-Born.

In the middle of Simla there is a good antique-curio shop. Above it rises a tumulus which is crowned by the Municipal Rickshaw Stand. From here a view of the polo ground at Annandale may be obtained, mist permitting. With the aid of glasses it is possible to make out the features of the Chief of Staff or H.E.'s naval attaché, and at the same time be spared the agony of listening-in to the players' language.

Polo language in Simla is particularly distressing, as most of the players belong to the Secretariat, or are *p.s.c.* (L) or (I). Annandale is the only place in the world where "Damn!" can be heard in thirty-seven different tongues.

The golf course is used as a week-end camp. The Heaven-Borns *senr.* pitch their tents on the greens; the remainder of the I.C.S. camp on the fairway; the rough is reserved for the exclusive use of the military.

Jakko is a small, tree-clad hill from which rockets are sent up on important occasions, e.g., on the departure of the A.P.M. on leave, or when an absent-minded member of the U.S. Club stands drinks all round.

Little Simla bears the same relationship to Simla proper as Bayswater does to Kensington.

(c) *Flora*.—Red rhododendrons. Multi-coloured cosmos. Conifers.

In recent years the forests have been seriously depleted in order to supply raw material for the wood-pulp industry.

A certain number of trees are preserved to furnish resin for the use of H.E. The Viceroy's string band.

(d) *Fauna*.—Simla possesses the usual fauna of all hill stations, viz., Airedales up from the plains for the hot weather, monkeys during the apricot season, and fleas in the rains. The last-named may be kept effectively at bay by drenching the bungalow with pulv. iodoformi q.s.

(e) *Ethnography*.—The population consists of:—

(i) Europeans.

(1) Heaven-Borns.

(2) Poor Whites.

(ii) Indians.

(1) Counsellors.

(2) Scribes.

(3) Jhampanis.

The Heaven-Borns wear mufti. The dress includes a curiously-shaped topi enamelled white.

The Poor Whites wear khaki with Sam Browne belts but, as frogs are not attached thereto, the less said about these people the better.

Nevertheless, any one member of this community is quite a big noise—out of Simla.

The Counsellors are rajahs, nawabs, mehtars, bahadurs, josses and jhangs. They are important and nice folk.

The Scribes, or Babus, are divided into two sects: the Chanderjee Bhowse and the Makkan Lallji. The former are bare-headed and wear navy-blue lounge jackets, pink-bordered flowing dhotis, khaki socks with orange suspenders and black patent-leather shoes.

The latter dress in black pill-box caps, or in whitish-grey pagris, tweed Norfolk jackets, voluminous whitish-grey pyjamas with strings of the same colour and desert-sand shoes.

Both sects carry umbrellas of a greenish-black hue and wear gold-rimmed glasses. They are very respectable.

They are the only people in India who can understand A.R.I. (Financial). They are exceedingly erudite.

The newcomer to India often says that the salvation of that great country lies in the total suppression, abolition, extinction or even destruction of the genus babuji. Theoretically this may be sound. Practically it is impossible. Were it to be carried out the Indian Post and Telegraph Department would not survive the shock for more than a week; the wood-pulp and paper-making industries would collapse; the manufacture of Indian ink would cease; and the million or so professional Petition Writers would rise in revolt.

Chaos, anarchy and bankruptcy would ensue.

No ; if India is to be saved let there be more, and still more, babus.

It must never be forgotten that the routine activities of the much-maligned babu provide employment for at least two-thirds of the present British official population of India.

Jhampanis are people who lead a double life, utilitarian and decorative.

In the ordinary way they draw water, wash plates, pull up the seedlings and cultivate the weeds, pretend to groom the pony, guard the bungalow at night when they are awake, and run messages.

In rôles such as these a ragged old blanket is the important part of a jhampani's clothing.

But when the memsahib steps into her rickshaw the jhampanis drop their pails, jharans, trowels, curry-combs and lathis, and proceed to rival Solomon in all his glory. Uniforms of emerald green with scarlet piping ; royal blue with canary kammerbands ; chocolate tunics with white shorts and orange pagris and puttees, etc.

Prior to 1914 the lady who achieved *the* social success of the season generally achieved it by the design, material, colouring and cut of her jhampanis' uniforms.

It is said that this pretty fancy is declining. A pity. Anything which will make for a Brighter Simla should be encouraged.

(f) *Social Amenities*.—These are divisible into three classes, based on the following three institutes :—

(i) The A.D.S.—The repertoire of the Simla Amateur Dramatic Society includes "His Excellency the Governor," "A Pantomime Rehearsal," "Lord Richard in the Pantry," and "East Lynne." The society is renowned throughout India for its dramatic talent, artistry and taste. It commands a good press. True, the *Pioneer* is not always complimentary, but it is published in Allahabad. The society is run on the lines of a stock company. This accounts for the phenomenal success of its productions. A statistician once attempted to discover how many soldiers in Simla were actors, and how many actors were soldiers ; but unfortunately he was transferred to the plains before the completion of his researches.

(ii) The Fine Art Society.—This society holds annual exhibitions. No drawing, sketch or picture is hung unless it is worth Rs. 15 at least. The valuation is done by the artist before the work is sent in. Prizes are given for the best exhibits in the various classes, e.g., for a sketch of a moonlight picnic ; for a still-life drawing of a vegetable marrow ; for a clay bust of the Mayor of Simla, and so on.

(iii) The Knights of the Effort Syndrome.

Coat of arms : A heart noir, maidan blanc, surmounted by a tiger rampant bearing a mohur en or.

Motto : "By stealth do we minister."

This is a secret order composed exclusively of wealthy men such as polo pony experts, racehorse owners, P.R.I.'s and Collectors. Prior to its formation it was not generally known that India teems with millionaires. So far as the public is concerned the Knights (E.S.) give a series of magnificent balls—not mere dances, but balls—during the Simla season. These functions only serve as camouflage for the Knights' secret activities, which take the form of anonymous cheques to needy subalterns; of finding *marraines* for lonely men who are enduring the heat and dust of the plains; of befriending the down-and-out Swarajist when his party stock is below par, and so forth.

All social matters are, in reality, organized, controlled, viséd and censored by the ladies of Simla.

These are the only ladies in India who count for anything.

It is said that this is due to the prestige of the magic word "Simla"; that it is *not* due to any special merits or charms of the ladies in question.

This is quite erroneous. It may even be spiteful. However, as I have already argued the point with Georgina, I now leave its elaboration to a more able and less fettered pen.

(g) *Simla in Winter*.—Few people know that Simla is still in being in winter. But it is.

When in October everybody else moves to Delhi, the Army Medical Directorate lights its fires, puts up its shutters and retires to its long arctic night under a pall of virgin snow.

This hibernation is not accidental. It is not even based on economical necessity. No. It is due to the watchful care of a paternal Government. It is decreed.

During the months of July, August and September, each member of the A.M.D. is subjected to severe shock and serious strain.

It is during these months that the malarial statistics are received in Simla from every part of India.

No human being could be expected to survive an annual nerve-racking experience of this kind without an antidote; so higher authority enforces an annual rest cure.

Time passes pleasantly, what with skating, snowballing, ski-ing sleighing and reading. It is most gratifying to learn that, in literature, the CORPS NEWS, R.A.M.C., is a first favourite. The *Journal U.S.I.* is a close second.

The recent meteoric rise of the latter provides a pregnant page in the history of Service periodicals. There was a time when the *Journal of the R.U.S.I.* competed with it in healthy rivalry, like the *Lancet* and the *B.M.J.*

That time is now past.

The home product has been left far behind by its Indian prototype.



The reason for this is worth considering, because it contains a lesson which, in my humble opinion, should be applied to our own Journal.

A new editor was appointed to the *Journal U.S.I.* Here are his qualifications:—

- (1) *Savant* and bibliophile (military).
- (2) Physical appearance modelled on Il Duce.
- (3) Courts-martial expert.
- (4) Ex-international footballer.
- (5) Orchid connoisseur.
- (6) Ex-Khan of Kurdistan.
- (7) Renowned shikari.

It is not enough that an editor should have suitable literary and technical gifts; above all he must be **VERSATILE** in the widest meaning of the word.

Suppose, then, that the editor of the *JOURNAL R.A.M.C.* were endowed as follows:—

- (1) *Savant* and bibliophile (medical).
- (2) The appearance of Moses.
- (3) "Long Roll" expert.
- (4) Ex-Gentleman Jockey.
- (5) Collector of antique stethoscopes.
- (6) Ex-Adjutant, *Depôt R.A.M.C.*
- (7) Handicap not above + 8.

We should then have reasonable expectations of increasing our circulation to an extent hitherto undreamed of.

N.B.—Before sending the above for publication I submitted it to several of my friends for comment. The following is an extract of a reply received from Malta:—

"This is the Age of Progress and Pep. Versatility is more than verisimilitude. May we melt our mouldy models in the fires of the New Journalism!"

To return to the subject of the A.M.D.—I regret that, on account of the Official Secrets Act, I am not at liberty to divulge what happened in the course of my visit to this directorate; but in the non-official sphere Georgina and I were treated in a most kindly fashion and enjoyed a thoroughly good time.

On the twenty-sixth day of the trip *L'Oiseau Rouge* slid downhill past Kasauli, Jutogh, Dagshai, Solon, Sabathu—places well enough known, but of little account; they are too near Simla; they are but the setting of the Jewel-Beyond-Price.

Ambala was reached on an expenditure of little more than a gallon of petrol over 96 miles.

On the twenty-seventh day we set out for Jullundur, distant 104 miles.

En route to Ludhiana we met another jatha of Akali Sikhs marching to Nabha State.

These militant pilgrims numbered about 400. They were uniformly dressed and equipped—brown khaddar shirts and shorts, black pagris with yellow forehead bands, haversacks, water-bottles and sticks.

They marched in military formation and gave the impression of a well-drilled, well-disciplined force.

Their ages varied ; middle-aged and old men predominated, their flowing locks and long hair filling a large part of the picture.

The slow, measured tramp and the general air of determination and solemnity were impressive ; but real religious fervour yoked to modern politics—how futile, how stupid, how sad !

Jullundur is one of the smaller cantonments of importance.

There is no hotel, and the dak-bungalow is small, shabby and badly situated. We arrived to find it crowded. The khansamah, a good fellow, arranged a tiny dressing-room and a screened doorstep for our accommodation ; the heat spoiled his efforts to make us comfortable under such conditions.

The Hop, a little shamefaced, made early application to visit his home in a neighbouring village.

" To see the crops ? " I inquired.

" Ji-ha," said he, and shuffled.

" To find out how your marriage bandobast is progressing ? "

For answer, a broad smile. He went off hurriedly, taking our good wishes with him, but leaving us to clean L'Oiseau Rouge. The task was easy for, while we worked on the ground floor, the khansamah's two chokkras, stripped, did the basement. There is no need for a pit in India.

Georgina and I sat down to dinner with a dapper little person aged about 40. He was plump and rosy-cheeked. His short, iron-grey hair was carefully brushed, and he was neatly dressed in a well-cut dinner suit.

His conversation, carried on in a mellifluous tenor voice, was pleasant and engaging. He told us that he had a farm about thirty miles out, where he went in for pedigree stock-breeding. Yarns of a lonely life in the mofussil gave us a glimpse of conditions which are never encountered in cantonments.

No sooner had dinner ended than Georgina beat a hasty retreat. Her manner told me something was amiss, but I failed to guess what it was.

The farmer and I sat on the verandah for an hour and, with the usual aids, discussed shorthorns, motor cars, clubs, mosquitoes and the monsoon, until I saw that if I didn't go to bed he never would. His comments and criticisms were glib, often shrewd and apparently inexhaustible ; they threatened to roll on in an easy, somewhat superficial, and always cynical, way for ever.

When I rejoined Georgina the following conversation took place :—

Self : " Why did you leave us so early ? "

G. (*sharply*) : " Because I didn't want to stay." Silence.

Self : " That's an extraordinary sort of fellow."

G. (*cuttingly*) : " I suppose you know that your 'extraordinary sort of fellow' is a woman ? "

As a matter of fact I did not. I never even suspected it. I hope Georgina believes that, but I have my doubts.

The Farmer of Jullundur is never mentioned now.

On the twenty-eighth day The Hop turned up late and subdued. Matrimonial shares had slumped. Not till we reached Amritsar did his wonted good humour return.

The way led pleasantly through a thickly-populated, well-wooded, fertile country heavy with crops.

After covering fifty-three miles we reached Amritsar and enjoyed a good breakfast-tiffin at a small, old-fashioned hotel.

In the sacred city of the Sikhs the following should be seen :—

(a) The S.M.O.—He is remarkable because he is a comparatively junior R.A.M.C. officer who enjoys fixity of tenure. This is by virtue of the fact that he is also Cantonment Executive Officer.

(b) Fort Govindgarh.—Erected by Ranjit Singh, 1805-09. Commanded by a French officer, and still bears military inscriptions in French.

(c) Mosquito-proof barracks.—The proofing was done in 1925 and is the first of its kind in India. Let us hope that it may be a milestone on the road of progress and ultimate victory.

(d) The Golden Temple.—This unique place of pilgrimage is so well known that description here is unnecessary; but the special incidents connected with our own visit may be of interest to others.

The visit was made at a time when relations with the Sikhs were very strained, but our presence at the temple did not seem to be resented in any way.

L'Oiseau Rouge approached the place through a narrow bazar crowded with white-robed pilgrims, gaily-dressed country folk, donkeys, dogs, tum-tums and taxis.

The air was heavy with the scent of jasmine and marigolds.

We parked the car and were escorted by a couple of plain-clothes Sikh policemen.

The tiny open space at the temple entrance was very unsavoury. That is the worst of the East; beauty and squalor, sunshine and disease ever in close association.

In the outer courtyard chairs were brought and we were divested of our shoes.

We were then requested to remove our stockings and socks.

Georgina flatly, and rightly, refused and was politely but firmly denied admission. She spent the rest of the time taking photographs and watching the proceedings from a high platform which overlooks the temple.

My curiosity gained the upper hand and off came my socks.

This was a mistake; Europeans need not go barefooted. I was bluffed into it by the officiousness of the temple attendants.

Next time I'll call that bluff.

Affixed to the main gateway is a tablet on which is written a splendid eulogy of Queen Victoria, and of all the blessings conferred on the Sikhs by the British Raj.

It would have been instructive to paste a leader from a Sikh newspaper of the day alongside that tablet.

The temple stands in the middle of the sacred tank, and is reached by a fine causeway.

If you are a Sikh you kiss the threshold of the temple before crossing it. A basin of Condyl's is *not* standing by.

The ground floor blazes with colour.

The marble walls and pillars are inlaid with cornelian, turquoise, jade and mother-o'-pearl.

The floor is richly carpeted, and the Granth Sahib reposes on heavily-embroidered, silken cushions.

Overhead is a large velvet canopy, which positively glitters with silver and gold thread.

A priest, surrounded by satellites in white robes, sits before the holy book. From the depths of his long, bushy beard the verses are intoned in an unending stream.

He has a mighty voice, so that all must listen and none shall fail to hear,

He is relieved at intervals; four hours on and two hours off, perhaps; but never for an instant does the reading of the Granth Sahib cease.

In front of the priest there is a carpet on which the pilgrims cast their offerings, mostly in copper. Everybody gives something, and each receives a small packet of sweetmeats, or similar tokens of sustenance, in return. For half an anna the packet is diminutive. I cast a rupee and was presented with a sort of wedding-cake which The Hop had to lump round. This confection mysteriously disappeared soon after our departure from the temple; but The Hop, being a good Mussulman, never told me what became of it.

The upper storey of the temple is divided into bays in which acolytes recite passages from holy script. These young men have good lungs, powerful diaphragms and brass-lined larynxes.

A couple of wandering sadhus clothed in flowing locks, long beards and marigold wreaths, stuck to our heels the whole way round. Every now and again they emitted blood-curdling shrieks and spun round like dervishes.

In the course of a special uplift one of them nearly spun himself into the tank.

Unfortunately, he recovered his balance just in the nick of time. The Hop was very disappointed.

The buildings, causeways, balustrades and so on are covered with coloured stone and mother-o'-pearl inlay work. This is mostly of Italian origin, and has been looted from various Moghul buildings, e.g., from the

tomb of the Emperor Jehangir at Shadara near Lahore ; from the tombs of this emperor's wife and mother ; from the mosque of Aurangzeb, and from the great Moghul palace at Lahore.

I mentioned something about this to my police guides. They didn't like it ; indeed, they took pains to point out that my information was wholly incorrect.

On leaving the temple precincts you face the Durbar Sahib. This is an attractive building ; well-proportioned, graceful and very " Eastern " in character.

By the time we reached the outer courtyard the policemen had recovered their good humour and washed my feet in a basin of spring water, put my socks and shoes on, and hoped I'd return to bless the place with another rupee. But their little speeches were cut short by a hoary old gentleman who garlanded us, read us a long sermon, and was still preaching when *L'Oiseau Rouge* dived into the whirlpool of the bazar.

A pleasant, albeit noisy, visit.

After a run of thirty-five miles we entered Lahore.

The history of Lahore is full of incident and peopled with many races and great personages.

The city was founded in the first century A.D.

In the tenth century it was a centre of Brahminism. In the thirteenth it suffered numerous Moghul raids until its capture in 1241.

In 1342 it was taken by the Kokhars. In 1398 it fell to Timur ; and in 1433 it was stormed by Shaikh Ali.

Under the Pathans the city enjoyed a fairly peaceful existence. Then arose Ranjit Singh and the Sikh domination ; and finally the British conquest and occupation.

Lahore was at the height of its splendour in the time of the Moghuls, and especially during the reign of Jehangir. This monarch built the Khwabgarh (Sleeping Palace), the Moti Masjid and the tomb of Anarkali. He died here in 1627.

The Shalimar Gardens date from 1667. An interesting comparison may be made between them and the gardens of the same name in Kashmir.

In the evening we went to one of India's modern plague-spots, a cinema, wherein was released a stupendous production in five reels, all the way from U.S.A.

Rudolf Valentino and Co. have taught the unsophisticated native a good deal about the life of the white man—and woman—which he never learned from his sahib. Theft, murder, drunkenness, lust. Very edifying.

On the twenty-ninth day we set out for Jhelum (103 miles) via Gujranwala.

Near the latter stand the mausoleums of Ranjit Singh, " The Lion of the Punjab," and of his father, Mahan Singh.

On the road we passed through dense clouds of fine, choking dust. From the sounds which proceeded therefrom we gathered that they contained squadrons of a British cavalry regiment on the march from Risalpur to Sialkot.

Further on we met the baggage train, including numerous "privately-hired" bail-carts drawn by fine, black-and-white dappled Hissar bullocks.

In Hissar, south of Lahore, there is a building called the Jahaj. It started life as a Hindu temple; later it was converted into a mosque, and finally it became the residence of one George Thomas. Hence its present name!

Near is Ferozepore, where there is a memorial church in commemoration of the Sutlej campaign of 1845-46. Also a Sikh gurdwara in memory of the heroes who fell at Gulistan in 1897.

Jhelum was hot and stuffy. A thunderstorm was threatening. It was advisable to get L'Oiseau Rouge under cover for the night.

The dāk-bungalow khansamah said he had a garage.

This turned out to be the verandah of the lamp go-down.

Planks were laid, up which I backed the car; but the fit was too fine; with a grind-scrunch-bang, down came one of the wooden verandah pillars. An oblique fracture.

The khansamah approximated the broken ends, bound them up with string and said: "Kucch fikr nahin; abhi bilkl achha hai!"

This pleasantly-philosophic attitude saved him from a severe wiggling, for we found the bungalow dirty and the meals distinctly second-rate.

After passing an uncomfortable night we left for Rawalpindi on the morning of the thirtieth day of the trip. The sixty-seven miles were covered without incident.

We stayed in Pindi for two days overhauling our gear and completing preparations for the second part of our holiday, which was to be spent in Kashmir.

The genesis of a holiday in KASHMIR is a lengthy and complicated business. It proceeds on these lines:—

(a) How shall we travel?

(i) Via Abbottabad.

(ii) Via Muree.

(iii) Via Jammu.

Also:—

(iv) By hired car.

(v) By private car.

And even:—

(vi) By tonga.

(vii) On foot.

(b) What shall we do when we get there?

(i) Houseboat on the Jhelum.

(ii) Hotel or boarding-house at Srinagar.

(iii) Camp at Pahlgam or Sonamarg.

- (iv) Hut at Gulmarg.
- (v) Trêk in the upper valleys and hills.
- (vi) Shikar in Baltistan and Astor.
- (vii) Explore Lesser Thibet.
- (c) What shall we take with us ?
  - (i) Clothes.
  - (ii) Servants.
  - (iii) Ponies.
  - (iv) Camp gear.
- (d) What shall we leave behind ?  
(See under "c" above.)

Annually from December 1 to April 30 these, and a dozen similar questions, are debated at great length. All your friends assist at these debates, and they all give different advice.

However, they all agree on one point, viz., that the Kashmiri is the biggest rogue unhung.

At the same time each one of them knows of ONE box-wala, golf chhokra, manji, shikari and pony-man who is the very acme of honour, honesty, industry and grit; and of ONE tiffin-coolie who is worth his weight in curry-pups.

"Nevertheless," say they, "beware! for with the exception of the ONE, etc., the Kashmiri is the biggest rogue unhung."

It is all very confusing—at first. Later on you discover that the best way to enjoy a holiday in Kashmir is to work out your own salvation.

We were already conversant with problems (a), (c) and (d) as, in former years, we had sampled (b) (i) and (iv).

This time we decided to try (b) (v).

In the end it turned out to be rather expensive, as transport (pack-pony) charges are high. Apart from this it is far and away the best and most enjoyable method of seeing Kashmir.

However, that's another story. . . .

L'Oiseau Rouge, overhauled and tuned-up, was faced with a severe task on the thirty-third day.

For a considerable distance out of 'Pindi the road is broad, flat and straight. Here the big, six-cylinder, American taxis with Indian drivers habitually bowl along at a good 55 m.p.h.

The road then climbs the red, scrub-covered foothills till, at the twenty-third mile, a height of 2,700 feet is reached at Salgram Bridge.

The next sector is steep and twisty, and the hillsides are precipitous and wooded. Tret is reached at mile 25; height 3,100 feet.

The terraced fields here are soon left behind, and the road steadily ascends through thick pine woods.

The Brewery stands at mile 32; height 5,300 feet.

More giant pine woods interspersed with tiny fields; a couple of villages and, at mile 38, you arrive at the Muree terminus; height 6,900 feet.

If distances and gradients be considered together, it will be evident that this piece of road imposes a considerable strain on the cars employed thereon.

*Muree.*

(a) The first place to be visited is, of course, the office of D.D.M.S., Northern Command.

This building is perched on a ledge which might have been chosen by a golden eagle. Its inhabitants are noted for their courtesy, business-like methods and industry.

Thus—two holidays only are taken per annum ; one on January 1, and the other on November 30. On these occasions the office flag (a red lion rampant on a yellow field) is hoisted.

When you enter the office you are given a Form to fill up :—

Rank——	Name——	Address——
<i>British</i>	<i>Regular</i>	<i>Married</i>
<i>Indian</i>	<i>Temporary</i>	<i>Single</i>
	(Strike out headings not applicable.)	<i>On duty</i>
		<i>On leave</i>
Date——		Signature——

The D.A.D.M.S. scans the form and, if it is satisfactory, shakes hands with you while the A.D. of H. and P. smiles enigmatically.

You are then conducted to The Presence.

At this stage of the proceedings it is well to be prepared for the unexpected. For instance, within five minutes I found myself led into discussing the derivation of “Kapurthala” ; the tonnage of *The Golden Hind* ; the composition and properties of thistle beer, and the geological formation of Edinburgh Rock.

It is hateful to think I may have deceived this great, yet charming and modest, man ; but I must admit that my knowledge of these subjects was neither extensive nor deep.

Perhaps he wasn't deceived.

When you leave, the D.A.D.M.S. presents you with a sprig of white heather. It is emblematic, and less expensive than the usual “stinker.”

(b) Lodge Himalayan Moon.

Himalayan Moon ! Take up your lodging o'er my bungalow ;  
 The ukelele wails afar, the saxophone is mute ;  
 For this yere guy there ain't no syncophating shuffle fun below,  
 Since Nancy's given her dancing pard the order of the boot.  
 Lodge Himalayan Mo-oon ! Lodge Himalayan Moon !  
 Your silver beams upon this coal-black coon ;  
 An' turn his wool a grey-green-desert-sandy colour soon  
 Very soon (clap, clap) ole' mo-oon.

Yes, you might think so ; but that isn't the meaning of “Lodge Himalayan Moon ” at all.

No.



The meaning was revealed to us when we received an invitation to be present at The Grand Annual Ball of Lodge Himalayan Moon (Regal and Antique Order of Masons).

Georgina isn't a Mason. I'm not a Mason. Had someone blundered?

But Masonry is secret and formidable, like The Klu-Klux-Klan. Now-a-days no dictator is really safe until he has abolished his Masons.

You can't afford to take risks with a society of that kind.

Happily for us Cosmo was in Murree. I have known Cosmo for nearly thirty years. He is a member of the R. and A.O. of M. We decided to consult him.

Cosmo said: "It is quite in order. This is the one occasion in the year on which the Masons make the non-Masons welcome. Come, and you will be honoured guests; stay away and—" Here Cosmo shook his head and looked grave.

We hastened to assure him we should be present, and we meant it.

A Confidential Report on Cosmo should read something like this:—

Thinks a lot but doesn't say much.

Quick to understand; slow to dogmatize.

Modest. Discreet.

Not intemperate.

When he is older, and has more experience, he could be usefully employed as M.O. i/c Kneller Hall, with a mandate to consign to the lethal chamber all students who show a rag-time diathesis.

Mrs. Cosmo is all that a good wife should be; but she is not yet fully aware of her husband's potentialities.

These preliminary remarks should be noted with reference to the series of amazing events which I shall now attempt to describe.

All roads converge on the place of assembly.

All the world and his wife, sisters, cousins and aunts have engaged all the jhampanis, dandies, rickshaws and tats in the Murree Hills.

Traffic control is not a strong point of the Indian police. The confusion and noise in the compound beggar description. So do the ladies' toilettes. It is a barra tamasha, beshuk.

We are rescued by the Masonic Gendarmerie—the black shirts of the R. and A.O.—and brought before the Senior Scrutineer, who nods approval.

The Gold Khud-Stick ushers us to front, dress-circle seats, in the balcony. Mrs. Cosmo arrives and tells us that Cosmo is below, in the anteroom, and in a state of nervous trepidation. We all agree that this is very strange.

Nine o'clock rings out from the neighbouring church spire.

The floor is cleared, and markers fall in.

The crowded balcony quivers with excitement and expectation. The babel of small-talk flickers and dies.

A band marches in and takes station on a dais. A single note on

a trumpet rings out loud and clear. Twelve trumpeters stand to attention and blow a fanfare.

The doors at the far end of the hall are thrown open, the band plays an inspiring quick-march and Lodge Himalayan Moon is on the move!

The order of march seems to be as follows :—

#### THE ADVANCE GUARD.

O.C.—The local cinema manager. Pale blue and white sashes. Chamois leather aprons. Entrenching tools.

#### PIONEERS.

O.C.—A deputy commissioner. Chamois leather sashes. Pale blue and white aprons. Slaters' picks.

#### *Fanfare.*

#### STANDARD BEARERS.

No. 1. Standard, pale blue and white, to match the decorations of the hall. No. 2. Standard a large Himalayan Moon. No. 3. Standard, a religious device. No. 4. Standard, a picture of a Flanders pill-box. The Standard Bearers' sashes are of gold, silver, platinum and tin [pure].

#### *Fanfare.*

#### ESCORT FOR THE STANDARDS.

O.C.—The local gramophone merchant. Chain-mail of pale blue and white enamelled links. Cat-burglar outfits.

#### THE BISHOP, VICAR AND CURATE.

A famous judge, a senior major-general and the manager of the Mulberry Hotel. Black sashes and aprons. Pale blue and white gaiters. Bunches of keys.

#### THE BEARER OF THE BOOK OF WORDS.

Sub-conductor, I.A.S.C. Sash of vellum and parchment apron. The Book is carried on a pale blue and white satin-covered cushion.

#### *Fanfare.*

#### VISITOR-DELEGATES FROM OTHER LODGES.

Twenty delegates, representing every part of the Empire and every walk of life. Sashes and aprons multicoloured and dazzling. Each delegate carries his visiting-card on a mortar-board.

#### *Elaborate Fanfare.*

#### *Band plays a slow march.*

#### COSMO.

We sit up and rub our eyes.

The slim figure in evening dress wears a pale blue and white sash and apron. A glittering jewel lights up the snowy shirt-front. A Master-Mason's mallet in ebony, inlaid with precious stones, is carried in the right hand, and a silver spirit-level in the left.

Cosmo advances three steps, is attacked with stage fright and retreats in disorder.

Mrs. Cosmo faints, Georgina says "Oh!" and a low murmur of sympathy runs round the crowded balcony.

After an agonizing interval (just long enough for swallowing purposes) Cosmo reappears, fortified and radiant. He shows his independence by striding along in his own time. The band-master makes a futile attempt to hurry the slow march, but he can't overtake our one and only Cosmo.

On aligning himself with his marker Cosmo faces about and halts. Loud cheers from everyone in the balcony, except Mrs. Cosmo. She is struggling between pride in her husband's position, and indignation at his duplicity; why did he not warn her beforehand? The rules of his craft? Stuff and nonsense!

Cosmo glances up and observes his wife's agitation. He decides to remain grave, inscrutable.

*Fanfare.*

*Band plays a quick-march.*

#### THE APPRENTICES.

Senior Apprentice.—Manager of the Dairy-Farm. No sashes. Pale blue and white aprons. Pamphlets—"Instructions on the manufacture of reinforced concrete."

#### THE MASTER OF CEREMONIES.

The local civil and military tailor. Court dress, and very well made too. In place of a rapier, a knout.

#### THE REAR GUARD.

O.C.—G.S.O. i. Iridescent pale blue and white sashes and aprons. Masonic thermos flasks and a stretcher.

*Band plays The National Anthem.*

An interlude followed, during which Cosmo was conducted to the stage of the hall. He stood in the middle of the stage, with the visitor-delegates grouped round him. All the other Masons remained standing in tableau formation in the body of the hall.

Conversations proceed thus:—

*Chief of the L. and A.O. of M. Gendarmerie (looking round):* "I spy strangers!"

*Cosmo:* "What sayeth my Chief Scrutineer?"

*Scrutineer:* "No complaints."

*Cosmo:* "'Tis well."

*Master of Ceremonies:* "I propose a dance."

*Cosmo:* "What say you, m'lud Bishop?"

*Bishop:* "I have little doubt that a dance, properly conducted, would tend to alleviate the tedium of these all-too-decorous proceedings."

*Cosmo:* "Do my brothers agree?"

*All Masons (in unison):* "Aye! Aye! that we do, kind master!"

*Cosmo:* "Then do I declare Lodge Himalayan Moon to be under the spell of Terpsichore for the remainder of this evening."

At this there was another fanfare, the whole assemblage gave three rousing cheers and the band plunged into America's latest exotic.

Georgina and I left at 1 a.m. Cosmo and Mrs. C. were still pirouetting. Apparently a satisfactory understanding had been arrived at.

On the same morning we boarded L'Oiseau Rouge at 9 a.m., and ran down from Murree Terminus to Sunnybank. Then comes a steep climb to the octroi post below Kashmir Point. From the latter Nanga Parbat, the giant of Kashmir, may be seen when visibility is good.

You may now turn off petrol and coast downhill for a distance of 29½ miles.

On the near side the mountains tower above you. Trees are scanty, and the slopes are so steep that, in the rains, the road is often blocked by huge landslides.

On the off side the ground falls away to the valley of the Jhelum River towards which you are descending.

In the middle distance rise the mountains on the other side of the Jhelum; and beyond them again, away to the east, you can see the snow-covered hills of Poonch.

Down, down, down; the drums of your ears clicking, and the air becoming hotter and more stuffy as milestone succeeds milestone.

Georgina says she is glad there is cholera at the foot of the hill—"for that means we shall have to push on as quickly as possible. Let's get out of this nasty stretch at once."

"Ji-ha," echoes The Hop, "Ziyada gurram hai."

The thin ribbon of river broadens out to a brown, raging and roaring torrent as we approach Kohalla. L'Oiseau Rouge crosses the trembling bridge and, on the thirty-fourth day out from Parachinar, and after covering 2,141 miles in all, we leave British India and enter the territories of His Highness the Maharajah of Jammu and Kashmir.

Kashmir is a country apart; hence the bridge at Kohalla is a fit point at which this story of our wanderings may be brought to an end. But, in a yarn of this kind, I notice that it is usual to indulge in a little homily for the benefit of the novice.

To those who are about to serve in India, I would say:—

- (a) In your dealings with the servants combine *kindness* with firmness.
- (b) Cultivate friendships in the *Indian*, as well as in the British, Army.
- (c) Work hard in the *hot* weather.
- (d) Don't hesitate to make yourself a nuisance in your efforts to extract a maximum amount of *leave*.

(e) Be *sympathetic* towards Thomas Atkins. What with malaria, and ration beef as tough as sun-baked rhinoceros hide, he has a deal to put up with.

On p. 80 of "My Rhineland Journal," Major-General Henry T. Allen, C.-in-C. of the American Army on the Rhine, writes as follows of the British:—

"... The men were spick and span as usual. In personal neatness and in general in the school of the soldier, they are well ahead of us, and I might say of the other soldiers of Europe."

If General Allen could say that of the men of the B.A.O.R., what would he say of the men of the British Army in India? Something which would make you throw your chests out, I know!

For Georgina and me this account ends on a happy note. As I pen the concluding lines a letter from India is handed to me :—

Salaam sahib! Salaam memsahib!

Peace be with you!

I am now married on the first of month ultimo.

I am extravagantly joyful thanks to your all-prevading protections.

My wife sends to the lady sahib greetings.

My brother is in need of a fountain pen.

Please to send prices of good fountain pens for information my brother.

I hop you reached to home safely from Karachi.

I and all my family are ever praying for your both long lives and prosperities.

NABHI BAKSH BEAVER.

P.S.—Don't fail to reply by return post enclosing prices good fountain pens.

When Christmas comes we shall send The Hop a pen.

THE END.

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## Current Literature.

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BUCHANAN, E. B. and PERKINS, R. G. **Residual Chlorine and the Bacterial Content of Swimming Pools.** *J. Amer. Water Works Ass.* 1926, v. 15, 386-90, 1 fig.

The pools examined were dosed daily, before opening, with chloride of lime equal to 0.5 p.p.m. available chlorine and samples of water taken for bacterial examination at intervals after dosing. The rate of disappearance of chlorine depends on the numbers of bathers using the pool, and at times, such as school vacation, when the number of bathers is largely increased, the bacterial count showed an increase. Collation of the figures shows that there is a point between 0.1 and 0.2 part available chlorine per million below which the bacterial count tends to increase; 0.2 p.p.m. available chlorine in the water is sufficient to maintain a low bacterial count.

An outfit is described by means of which the operator of chlorination plant may readily determine the amount of free chlorine in the water. The arrangement consists essentially of three colour comparison tubes in a stand. The outer tubes are filled with copper sulphate-potassium dichromate standard colour comparison solution equivalent to 0.2 and 0.5

part available chlorine per million respectively. The centre tube is for the water to be tested. A bottle of ortho-tolidin solution and 0.5 c.c. dropper are provided, and the tubes are provided with dust covers, etc. It is stated that the colour comparison tubes last at least nine months without need for refilling. For a test the central tube is filled to the 50 c.c. mark with water, 0.5 c.c. ortho-tolidin added and colours compared after one minute. If the colour developed lies between those of the comparison tubes, the water is all right, if the shade is lighter than that of the lighter comparison tube the water is dosed with chlorine equal to one-half the dose put in before opening (0.5 p.p.m.).

[The set should prove of value to those in control of continuous chlorination plant; in such case the standard colour tubes might be closer 0.2 and 0.3 p.p.m. respectively, and the operator instructed to maintain a constant concentration of chlorine in the water.]

G. T. P. TATHAM.

*Reprinted from "Bulletin of Hygiene," Vol. 2. No. 5.*

REGISTRAR-GENERAL, ENGLAND AND WALES. **The Registrar-General's Statistical Review of England and Wales, for the Year 1924.** (New Annual Series No. 4.) Text, vi + 155. 3 figs. 1926. London: H.M.S.O. [5s].

It is only possible to give a few of the features of this valuable review of the vital statistics of England and Wales for 1924. The deaths registered during 1924 numbered 473,235, the smallest number recorded since 1867. Mortality was highest in the first quarter of the year, and the excess was largely due to influenza. The rate of infant mortality was slightly higher than that recorded in 1924. The increase was accounted for by an increase in deaths from respiratory diseases. The increase in mortality from injury at birth which had been noted for previous years was maintained in 1924.

At all ages under 75 years, the mortality of each sex was lower than before the war, but the fall at ages 0—5 was much greater than at any other period of life. It was pointed out that in the report for 1923 that ages 1—5 was the period of life at which susceptibility of mortality to environment was greatest, "so it is probable that improvement in the conditions under which these children are living, for which the fall in the birth-rate may be largely responsible, has been the main factor in bringing about this remarkable change."

The standardized mortality from tuberculosis showed a slight decrease from 1,049 per million living in 1923 to 1,039 in 1924. Mortality from cancer had increased from 970 in 1923 to 990 in 1924. For the first time on record, the standardized mortality of males from cancer exceeded that of females and the tendency to increase was greater for males. A comparison was made of the mortality in accessible and inaccessible sites in both sexes separately for the periods 1901-10 and 1911-20. For females the percentage

increase was greater in the inaccessible sites but males showed a somewhat greater increase in the accessible than in the inaccessible sites.

Mortality from diabetes had declined from 119 per million in 1922 to 109 in 1924. Female mortality exceeded that of males, a new feature in the mortality from this disease which was first noted in 1920.

An interesting feature of this *Review* is the analysis of mortality due to accidents by type of vehicle causing death. The death rate attributed to mechanically propelled vehicles in 1924 was 77 per million living, the highest rate yet recorded. In 1911 the rate was 20. The motor bus has caused over 3 times as many deaths as the electric train, and the motor cycle was responsible for only 10 per cent. of the total deaths. The age distribution of fatal accidents classified by type of vehicle showed that children provided a disproportionate number of victims for which the motor car and motor lorry were chiefly responsible. Motor cycles were more frequently the cause of death between the ages of 20—45, in other words were especially dangerous to their drivers.

H. M. WOODS.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 5.*

KOHN-ABREST, E. L'oxyde de carbone et l'hygiène. [**Carbon Monoxide; Hygienic Aspects.**] *Ann. d'Hyg. Pub. Indust. et Sociale.* 1927, v. 5, 213-23. [4 refs.]

Two fundamental facts are restated; that death occurs when two-thirds of the hæmoglobin in the blood is saturated with carbon monoxide; and that the amount of CO in the blood depends on the amount in the air. Apparently exposure, however prolonged, to an atmosphere containing less than 1 part CO per 1,000 should not cause death. But the author sounds a note of warning, since a variety of concomitant circumstances, such as pathological lesions, or oxygen poverty in the air or CO<sub>2</sub> richness, may reinforce the influence of CO. Eighty cases are quoted, in half of which the percentage of hæmoglobin found affected by CO was below 60, indeed in 22 it was below 50. The opinion is expressed that, where more than 50 per cent. of the hæmoglobin is found associated with CO, death may be fairly ascribed to this gas; and that when less than fifty per cent. is found associated with CO, inquiry should be made to discover a possible reason for increased toxicity at such a concentration. The matter is a medico-legal one; but there is risk of under-estimating the poisonous properties of CO which should not be disregarded until only 20 per cent. or less of the hæmoglobin is associated with it. Atmospheres containing 1 part per 5,000 are not to be regarded as harmless for permanent breathing, particularly if exercise be taken. The limit should be placed at 1 part per 10,000 or even lower. The appearance of a train of symptoms—*anæmia*, weakness, troubles of vision, memory and digestion—coincident with prolonged exposure to small doses, justifies a diagnosis of chronic CO poisoning in which many authorities do

not believe. Figures are given of amounts of CO found in America to be given off in the exhaust gases of motor cars, showing the need for ventilating garages. Similar observations are to be made by the author on the air of Paris.

E. L. COLLIS.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 8.*

SCHMIDT, P. Neuere Forschungen ueber das Wesen der Bleivergiftung. [Recent Investigations into the Nature of Lead Poisoning.] *Klin. Woch.* 1927, v. 6, 367-9. [4 refs.]

Attention is called in this article to the importance of the early detection of lead in lead workers by examination of the blood, by chemical micro-analysis and by the use of the spectroscope, with a view to adopting prophylactic measures. Lead poisoning can by such means be detected much earlier than by clinical symptoms. The blood picture will show signs of lead two to six days after the inhalation of lead vapour, and will show it sooner when the absorption is by the lungs than when by the alimentary canal. The red bone marrow has a capacity of accumulating lead equal to that of the liver and by its action serves as a graduated indication in the blood picture in the form of polychromatic and granular basophilic erythrocytes. The changes which normally occur in the intestines, of urobilin to bilirubin, and of hæmochromogen to bilirubin and urochromin, become arrested by the action of lead. Then there is an increase of urobilin and the appearance of intermediate by-products, porphyrin and koproporphyrin, which can be detected in the spectrum.

The absorption of large quantities of lead leads to a spastic action on the vessels and the so-called lead colour, which may arise without anæmia, is caused in the early stage by the spastic contraction of the vessels of the face, followed by impregnation with porphyrin. To the practised eye this lead colour is an important sign, especially when combined, as it often is, with a painful expression.

Prof. Schmidt states that he has not changed the opinion he published in 1907 that the appearance of granular basophilic erythrocytes in the ratio of at least 100 per million is an extremely useful confirmation of lead poisoning. It is to-day considered that 1,000 per million shows a deep-seated condition and a liability to illness, and that 100 per million is a condition which should be carefully observed. Systematic blood examinations of lead workers are strongly recommended.

By chemical micro-analysis by the colorimetric reaction, a tenth of a mgm. of lead in 100 c.c. of blood, or 1,000 c.c. of urine can be detected.

The spectroscope can be used for qualitative confirmation, but not for quantitative estimation.

For prophylactic measures great importance is laid on the selection of



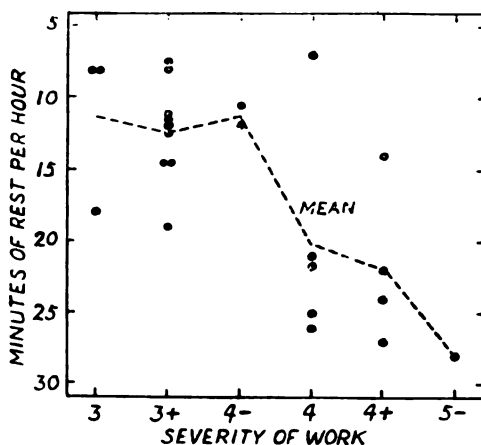
workpeople, the selection to be in relation to the condition of the persons' blood, kidneys, arteries and nervous systems.

A. J. COLLIS.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 8.*

VERNON, H. M., and BEDFORD, T., assisted by WARNER, C. G. **Rest Pauses in Heavy and Moderately Heavy Industrial Work.** *Med. Res. Council. Indust. Fatigue Res. Board. Rep. No. 41.* 24 pp., 6 figs. 1927. London: H.M.S.O. [9d.]

Rest pauses present different problems when considered (1) for light labour which might otherwise be steadily continued throughout the work spells, or (2) for work so heavy that it cannot be continued for long without some sort of a break. For light labour brief organized rest pauses have been shown to cause some improvement in output. Observations are now reported from such strenuous occupations as road making, dock work, agriculture and coal mining. The men, if paid by time, are found to take a



Relationship between severity of work and duration of rest pauses in various industrial occupations of a moderately heavy and heavy character.

[Reproduced from the *Industrial Fatigue Research Board, Report No. 41*, by permission of the Controller of H.M. Stationery Office.]

brief rest about every six minutes, amounting to a total of about 11 minutes per hour; "it is rather surprising to find that the groups of men employed in different occupations should have spontaneously adopted such remarkably similar habits." An approximately regular alternation of activity and rest is naturally adopted in uniform work; but the rest pause rhythm is upset when work is not regular. A direct relation was found between the total length of rests spontaneously taken and the arduousness of the task. Piece-rate earners on similar heavy work took rather shorter rests than day-rate earners, but the rests were frequent and longer for heavier work,

from 22 to 26 minutes per hour in pitch loading, from 14 to 28 minutes in rolling tinplates, and from 7 to 22 minutes in coal getting. The rests of miners varied according to atmospheric conditions; the higher was the wet bulb thermometer, i.e., the lower the cooling power of the air, the longer were the rests. But the work performed by miners is too irregular for establishing any orderly scheme for rest pauses. Rests taken voluntarily usually lasted less than a minute and were of much more value in relieving fatigue than involuntary rests, due to talks with the deputy or waiting for tubs, which are outside the control of the men. On the grounds of efficiency such involuntary rests should be reduced to a minimum.

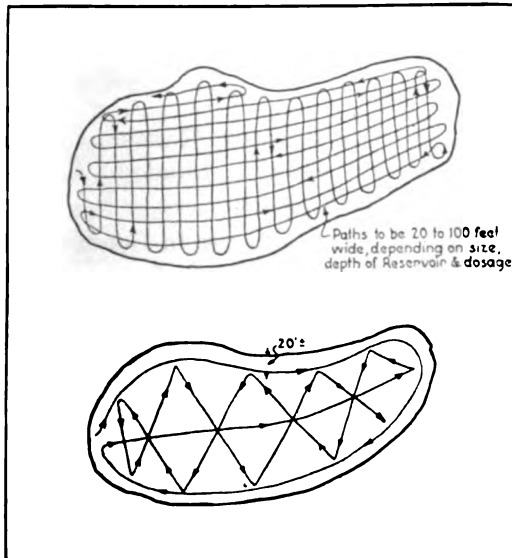
E. L. COLLIS.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 8.*

**HALE, F. E. Algae Treatment of Reservoirs, Recent Experience.**

*J. Amer. Water Works Ass.* 1926, v. 16, 765-8, 1 fig.

At the end of August, 1925, the Jerome Park reservoir was treated with copper sulphate (0.18 p.p.m.) for *Asterionella*. A fortnight later, when the reservoir was brought into service again, investigation of complaints as to taste showed that decaying organisms had concentrated in the bottom



Method of applying Copper Sulphate to large and small reservoirs.

[Reproduced from the *Journal of the American Water Works Association*.]

water. A secondary growth of *Dinobryon* had also occurred there, the protozoa presumably feeding on the decaying *Asterionella*. A second dose of copper sulphate was given just three weeks after the former and at the same rate of dosage, and it was found that the organisms in the bottom

water were this time destroyed, although the dose, as usual, was given at the surface. The depth of the reservoir is 25 feet. As a result of this experience new procedure for treatment and putting into service of reservoirs was developed. Care must be taken in distributing the copper sulphate; figure 1 shows the course of the boats for large and for small reservoirs. On large reservoirs the courses are parallel in one direction and then parallel in a direction at right angles to the first. On small reservoirs the courses triangulate the surface.

The water should be inspected the third day after treatment to find out the condition of the organisms, whether dead, decaying or mere shells, and the rate at which they settle. When turning the reservoir into service the flow should be established by mixing effluent with bypassed water and noting condition of effluent and mixed water; care should be taken not to stir up deposits and, if possible, water should not be drawn from the bottom of the reservoir.

GUY T. P. TATHAM.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 8.*

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## Reviews.

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THE LIFE AND WORK OF SIR PATRICK MANSON. By Dr. Manson-Bahr and Lieutenant-Colonel A. Alcock. London: Cassell and Co. 1927. 8vo. Pp. ix + 273, with 12 plates.

At the International Medical Congress in London, in 1913, Sir Patrick Manson was hailed by M. Blanchard, the Professor of Parasitology in the University of Paris, as the Father of Tropical Medicine. In the volume before us the story is told, stage by stage, how he gained this title by his work in China and in London.

Manson's temperament was philosophical and contemplative. His keen powers of observation and love of investigating the phenomena of natural history were displayed early in life, for, as a boy, he was profoundly interested in a tape-worm, which he found in the body of a cat he had shot! He commenced life in an engineering firm, but, being obliged to abandon his work there on account of some paretic affection of the right arm, due to a spinal curvature—physical defects which, though they lasted through life, were not recognized by those who knew him in later years—he took to the study of natural history, and from that went on to medicine. He passed his professional examinations at Aberdeen University when only 20 years of age, and graduated when he was 21 in 1865. In the following year he was appointed Medical Officer to the Imperial Chinese Customs Service in Formosa, and was transferred to Amoy five years later. It was

in Amoy, where he worked amongst the Chinese as surgeon, physician and general practitioner for twelve years, that he made those great discoveries in filariasis that directed attention to the influence of blood-sucking insects as intermediary hosts in the transmission of many tropical diseases. In carrying out his experimental investigations there, Manson had none of the advantages now enjoyed by research workers in the well-equipped laboratories that are to be found to-day in most centres of medical work in the tropics. He was isolated from the scientific world and had no better mouth-piece than the *Chinese Customs Gazette* and missionary reports. Yet he achieved a success that has never been surpassed in throwing light on the relationship between biology and pathology. To his observant and contemplative mind medical science was rooted and grew in biology; and, when we think of it, it is to Manson's work in Amoy that we owe our subsequent knowledge of the causation and transmission of such diseases as malaria, yellow fever, relapsing fever, trench fever and other diseases in which blood-sucking insects play a part. It was long, however, before his work was recognized in his own country. Many eminent physicians in London scoffed at his theories. Others before him had, it is true, studied tropical diseases and indicated their parasitic or protozoal origin, but Manson "was the first to expound by simple, verifiable experimental methods, the manner of their causation and propagation."

In 1883 Manson left Amoy for Hong Kong to engage in private practice, and left the Far East to settle at home in 1889, after acquiring considerable wealth. In Hong Kong his name is chiefly associated with the development of education amongst the Chinese. In 1887 he inaugurated the Hong Kong Medical College. In his inaugural address as Dean, an address which is reproduced in full in the volume under review, he gave expression to a remarkable prophetic vision of the awakening of China, a vision the embarrassing reality of which we are witnessing to-day in the complicated revolutionary drama that is being staged there.

Manson settled in London and was appointed Medical Adviser to the Colonial Office in 1897. It was during this period that he came in touch with Sir Ronald Ross. His influence on, and intimate association with, the latter's work are not generally known, but they are admirably and convincingly exposed by the authors of this volume in a series of letters and extracts from letters written between the years 1895 and 1899. During all these years Manson was doing everything in his power to facilitate Ross's investigations, to direct his work, to encourage him to continue his researches, and to bring his results to notice in the medical journals and at meetings of medical societies at home. It was under his direction and constant advice that Ross succeeded in demonstrating the life cycle of the malaria plasmodium in the anopheline mosquito, and in proving the mosquito to be the infective agent. When Ross was obtaining negative results and losing confidence in Manson's theories, Manson practically compelled him to "try, try, try again." As we are told in this book

"before Manson came on the scene, the solution of malaria transmission appeared hopeless, even to Ross." Indeed we feel in reading the account of Ross' work, that Manson was the greater of these two experimental investigators.

Manson's work in London is comparatively recent and culminated in the inauguration of the London School of Tropical Medicine in connexion with the Seamen's Hospital Society. Dr. Manson-Bahr and Lieutenant-Colonel Alcock have done us a service in producing a book that is a timely tribute to the memory of this great man. It is admirably written and full of interest; and those who knew Sir Patrick Manson, when he lived amongst us, will know him better and love him more after reading this story of his life and work.

FORENSIC PSYCHIATRY. By W. Norwood East, M.D. London: J. and A. Churchill. 1927. Pp. ix + 381. Price 16s. net.

The detailed title of this book is "An Introduction to Forensic Psychiatry in the Criminal Courts." No more difficult subject could be discussed in a textbook than the relation of law to medicine in cases charged by the law on a criminal offence, and in which the medical profession frequently has to give an opinion. Much attention in the courts has lately been drawn to the different opinions existing between the law and medicine, in regard to cases which may exhibit mental symptoms, and the two professions are apt to speak harshly of each other's shortcomings. On many occasions attempts have been made to find a basis of agreement in order to define Criminal Responsibility in a way which will satisfy both professions, but the subject is so subtle and controversial that no hard and fast rules have ever been satisfactorily evolved. Dr. East throughout his book has put before the reader such information as will be of practical value to him in the witness box, and he believes that in spite of the unsatisfactory and inharmonious relation between the two professions often seen in the courts, no case has occurred recently in which a prisoner was convicted on evidence that appeared to justify his acquittal on the ground of insanity. Indeed, the author feels that alterations in the law might result in its less elastic administration with consequent hardship to the offender. The expressed purpose of the book is to serve as an appendix to the textbooks which deal with the wider aspects of mental disorders, but in fact the many illustrative cases given in detail must make the reader more familiar with the symptoms and possible results which may appear. As the judicial authorities in the criminal courts are concerned primarily with facts, and recognize that the theories of the present may prove to be the fallacies of the future, the author has as far as possible avoided theoretical considerations; such an attitude makes the book of far greater practical value. An interesting chapter on Criminal Responsibility gives the opinions of various legal and medical authorities, which have been arrived at as a

result of well-known trials, including the frequently quoted McNaghten case in 1843, as a result of which the House of Lords put certain questions to the judges, the answers to which are called the Rules in McNaghten's case. These rules in the main still hold good, although a committee on Insanity and Crime in 1922 indicated that the legal test of insanity in the criminal courts was considered to be unsatisfactory, but that, notwithstanding, no alteration has yet been found which would meet with general approval. Mental deficiency, imbecility and feeble-mindedness are dealt with at very considerable length, and reference is made to opinions of all leading experts in these special subjects, which makes the chapter a mine of information. Other mental diseases follow, and in each disease special reference is made to their possible forensic importance, and illustrative cases are dealt with in detail. The book concludes with a very good chapter on Feigned Insanity, but the author agrees that certain cases may require months of careful observation before the truth is ascertained. The book is of great value, and is of particular interest in view of the conflicting evidence reported in the Press in trials involving the possibility of insanity, where medical knowledge relating to insanity is often shown to be fragmentary, based on opinions without facts, and quite as incomplete as the legal opinions.

W. L. W.

THE DIAGNOSIS AND TREATMENT OF VENEREAL DISEASES. By David Lees, D.S.O., M.A., M.B., F.R.C.S. Edinburgh: E. and S. Livingstone. 1927. Pp. xvi + 605. Price 15s. net.

This is a convenient-sized volume of 605 pages, with 87 descriptive illustrations.

The work is divided into two main parts. Part I comprising seventeen chapters, deals with syphilis, and Part II, in the same number of chapters, is devoted to gonorrhœa. A very comprehensive pharmacopœia is added giving details of all the formulæ and drugs ever likely to be of practical use in treatment. An excellent index completes the letterpress.

The author is to be congratulated on his work. The whole subject is dealt with in a thorough and comprehensive manner, which must convince the reader of the author's complete mastery of his subject in every detail.

The book is quite up to date and incorporates the latest and most authoritative views as regards the diagnosis and management of cases. It is essentially a practical book, written by one who has had a wide practical experience, and although Dr. Lees may appear sometimes to be unduly dogmatic, he is always sound and interesting. His practical knowledge has convinced him of the importance of details, and he has spared no pains to be clear and thorough in all his descriptions and accounts of essentials.

The key-note of this work is clear-mindedness and thoroughness. It is gratifying to find that principles and methods initiated in the Military Hospital, Rochester Row, as applicable to Army life, have stood the test of time, and seem no less applicable wherever the treatment of venereal disease is efficiently carried out.

This book is highly recommended to all officers as excellent in every way—the print is good and the book is eminently lucid and readable.

TREATMENT OF VENEREAL DISEASES IN GENERAL PRACTICE. By E. T. Burke, D.S.O., M.B. London: Faber and Gwyer, Ltd. 1927. Pp. 162. Price 5s.

This book presents in a brief and clear manner a scheme for the routine treatment of venereal diseases such as can be carried out by general practitioners.

The author has succeeded in the difficult task of giving sound and clear instruction in a very small space—the book can be read in a few hours.

In the treatment of syphilis by arseno-benzol compounds, he is a strong advocate for their administration intramuscularly rather than intravenously—and rightly—as it is the opinion of most syphilologists that arseno-benzols by the intramuscular route are therapeutically more active than equal doses given intravenously; it follows as a surprise that in all the “schemes of treatment” for syphilis proposed—stabilarsan (which is practically always given by the intravenous route) is the compound used; in the text the author advises stabilarsan for intravenous and sulpharsenol for the intramuscular injection.

The “obiter dicta” at the end of each section are mostly sound, many are amusing; there are some with which we entirely disagree: “The one safe way of treating a soft sore is by calling it syphilis.” “The position should be explained to the patient, and his must be the responsibility for deciding as to whether treatment will be delayed till the blood gives a positive Wassermann.” “A pure chancroid is extremely rare.” Our opinion is that a pure chancroid is *not* extremely rare; the diagnosis chancroid made by experienced observers shows that the so-called double infection, i.e., mixed chancre, occurs in less than 3 per cent. of cases. To treat every venereal sore as syphilis is to admit our incompetence, and it is the doctor’s job to make the final diagnosis—not the unfortunate patient’s.

The section of the book on gonorrhœa is very sound and up to date.

This small book, at such moderate price, should be popular with the general practitioner, as it gives definite and generally accurate guidance—in clear language—and leaves us in no doubt as to what the author considers the correct line of treatment to adopt in the various manifestations of venereal diseases.

**IMMUNITY IN SYPHILIS.** By Allan M. Chesney. Johns Hopkins Medical School. Baillière, Tindall and Cox. 1927. Pp. ix + 85. Price 11s. 6d. net.

This monograph is an extension of the older summaries of the experimental work in relation to immunity in syphilis, so ably carried out by such investigators as Neisser, Levaditi, Bruck and Zinsser.

It gives a detailed account of the recent important data regarding immunity in syphilis, in addition to a complete summary of the experimental work on the susceptible animals, monkeys and rabbits.

A note is made on the recent work of Kolle and Evers, who have reported the successful transmission of syphilis to guinea-pigs with such regularity as to permit of their utilization for the study of experimental syphilis.

Those who require an exhaustive work of reference upon which to build their own experimental researches into the immunity to syphilis acquired by experiments on animals will here find all that is necessary in a concise and accurate form.

With the aid of the bibliography appended to the work, the immunologist should find reports of all the most recent work readily accessible.

**MALARIAL PSYCHOSES AND NEUROSES.** By W. K. Anderson, M.D., F.R.F.P.S.Glas. Humphrey Milford, Oxford University Press. 1927. Cr. 8vo. Pp. vii + 395; 18 figures, 4 plates. Price 42s. net.

Malaria, traceable for twenty-five centuries, world-wide and universal, a cause of decadence, and now an imperial problem of the first importance, has not been fully dealt with in its neurological aspects. Dr. W. K. Anderson's elaborate book is intended to fill the gap. As it embraces the history, the effects, the pathology, and almost every other branch and ramification of a wide and abstruse subject, "Malarial Psychoses and Neuroses" stands as a work which is remarkably comprehensive. It is unlikely, however, to meet with universal acceptance; for the author sets out to prove a great deal that is not usually laid at the door of this admittedly long-ranged scourge of mankind. He is prepared to attribute almost every type of psychosis to the evil influences of malaria; backed by a multitude of examples chosen from a multitude of sources, Dr. Anderson stands ready to prove that there is no clinical limit to the variation of pictures produced by the "subtle and nefarious parasite."

Yet in a book that is speculative to the doubting, the unconvinced, and the unconvincible, one that presents a difficult task to the impartial reviewer, it is possible to stray far from the areas of contention and find a mass of ordered, sound scientific knowledge. The chapters on the effects of malaria on character, and race degeneration, for example, are of absorbing interest; the pathological aspects of the disease are fully dealt with, well written and readably expressed, while there is an excellent chapter on latent



malaria. Four coloured plates and eighteen illustrations are distributed through the text. There are no less than thirty-four pages of references, followed by an index of authors and index of subjects. The references are arranged in subject headings—historical, medico-legal, surgical, and so on; they comprise a malaria bibliography from all sources that begins with Herodotus and descends through the ages to our own Journal. Dr. Anderson's work is the outcome of long experience of the disease and patient toil; interesting it undoubtedly is, convincing it may or may not be, yet it should stand as a textbook on malaria, able, not without difficulty, to weather such storms of criticism as may arise on account of the valuable material that it contains. M. B. H. R.

THE MEDICAL ANNUAL. Forty-fifth Year. Bristol: J. Wright and Sons, London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd. 1927. Pp. civ + 624. Price 20s.

The Medical Annual of 1927, the forty-fifth of this series of medical milestones, is as full of interest as its predecessors. 1926 was not a year of exceptional progress, but the Annual's thirty-four contributors have succeeded in filling its pages with interesting and practical matter that maintains the previous standard of the work. The editors call attention to two great simplifying forces that are beginning to impart order and direction to modern medicine. One is a disposition to think in terms of causes; the other, a tendency to use the simple forces of Nature as therapeutic agents—sunlight and fresh air. Both of these forces should be of much interest to us.

A new departure is an article on obstetrics and gynæcology in the East. There is an exceptionally interesting contribution by Sir Henry Gauvain on phototherapy. The editors state that the application of the principles of phototherapy is working a revolution in hospital construction, and are inclined to think that this revolution will include and reshape the whole science and art of medicine. Milk in its public aspect is very fully discussed. Mental disease is also dealt with exhaustively under several headings. In some cases articles are summaries of recent investigations, while others, of more interest to the casual reader, comment upon and discuss in unbiased manner the trend of medical thought in the light of recent investigations.

It is always encouraging, in a volume of the "Medical Annual," to observe references to the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, and to the work of R.A.M.C. officers. The reviewer notes with pleasure several such references, under the headings of amœbiasis, bacillary dysentery, gonorrhœa, leprosy, malaria and typhus. Manifold's investigations and conclusions on the burning question of dysentery are recorded in the article on bacillary dysentery. One is inclined to speculate whether we are entering upon the opening phases of the battle of the dysenteries! The

leprosy reference is historical ; an intriguing ray of MacArthurian brightness, focused upon the person of the late King Robert the Bruce.

M. B. H. R.

MANUAL OF BACTERIOLOGY. By Robert Muir, M.A., M.D., Sc.D., LL.D., F.R.S., and the late James Ritchie, M.A., M.D., F.R.C.P.Ed., revised with the co-operation of Carl H. Browning, M.D., D.P.H., and Thomas J. Mackie, M.D., D.P.H. Oxford University Press : Humphrey Milford. Eighth edition. Pp. xxiv + 821, 211 illustrations, 6 coloured plates. Price 16s. net.

A manual which has reached its eighth edition needs no introduction, least of all such a well-known and trusted friend as "Muir and Ritchie." This latest edition is, however, the more welcome, as it is eight years since its immediate predecessor appeared, and in this interval much new material has accumulated for sifting and sorting and presentation in an accessible and palatable form. In this task Professor Muir and his colleagues have exercised the same judgment and discrimination which characterized the earlier editions of their work, and the harassed medical officer may rest assured that he can apply here for information of unquestionable soundness on matters bacteriological—and not be disappointed.

To summarize such a book as this is impossible, and one can only draw attention to a few of its more salient features. Perhaps the most striking achievement is the section on "Serology and Immunity." Although this occupies only 111 pages, it is a very complete résumé of a subject which has of late become very diffuse. Nothing of importance belonging to what is at present regarded as the realm of fact is omitted, and of these matters, still in the controversial state, a very balanced account is given. In addition to theoretical considerations, the technique of all the more important methods of investigation is given. In parenthesis it might be remarked that, in the Army, Dreyer's modification of the flocculation test for syphilis has been found more successful than the earlier method detailed here.

The chapters on bacteriology proper are very full. Not only are all particulars given regarding pathogenic organisms, but allied organisms which might be confused with the pathogenic species are described sufficiently to permit of differential diagnosis—a fact which greatly adds to the value of the manual as a book of reference. The Dick reaction, melioidosis, *Bacterium pneumosintes* (whose ætiological rôle in influenza is regarded as "not proven"), *Bacterium tularensis*, *Bacillus abortus*, are among a few of the subjects which have come to light of recent years, and which find a place in this edition. A chapter is devoted to Rickettsia infections, and two to filter-passing viruses, in which will be found *inter alia* the latest work on small-pox, rabies, and poliomyelitis. Gye's work on carcinoma is not mentioned. Despite the title of the book, pathogenic protozoa and

fungi are very adequately treated, and the final chapter is an appendix dealing briefly with methods employed in sanitary work.

An excellent bibliography is given. This occupies a section by itself and is divided into chapters corresponding to those in the text. It will afford an excellent nucleus for anyone who wishes to pursue further any of the subjects.

The wealth and range of sound information in this book, combined with the compactness of the volume, and last, but not least, its modest price, render it an ideal work of reference for the Army medical officer.

J. S. K. B.

RECENT ADVANCES IN HÆMATOLOGY. By A. Piney, M.D. Published by J. and A. Churchill, London. 1927. Pp. viii + 276. 4 coloured plates. 18 illustrations. Price 12s. 6d. net.

This book is one of the "Recent Advances Series." It is an attempt to weld together the numerous isolated data and great body of available facts on the very difficult subject of hæmatology into a comprehensive whole. It is an ambitious little book, and a great achievement for one whose knowledge of such matters must have been acquired for the most part since the Great War. The book is not by any means easy reading. It is unusually full of long and difficult words; but there is no doubt about its merit. Very many—in fact the great majority—of the authors quoted are of German or French nationality, and it is only through a book like this, written by a man with a real knowledge of both these languages, that the average student can keep himself abreast of the times. The book consists of fourteen chapters with a summary, two appendices and a useful index. The second chapter on the development of the blood-cells seemed to me to be particularly good. The four coloured plates at the end are reprinted from the *Journal of the Royal Microscopical Society*, and are very fine. The scale which appears on Plate IV only might with advantage be printed on the other three plates as well. One or two of the expressions and phrases used—such as "almost only," p. 136; "unpleasantly well seen," p. 147; "from a pin-head to a lentil," p. 154—might possibly be improved upon; and I must say I do not like the expression "hepatectomised geese," p. 8. One or two printer's errors—"periphra," on p. 72, "durpura," on p. 173, in "any" cases on p. 199, a full stop missing after menstruation on p. 180—were noted, but with such a host of difficult long words it is evident that the proof reading has been very thorough. It goes without saying that the printing and general appearance of the book are excellent.

A. C. H. G.

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# Journal of the Royal Army Medical Corps.

## Original Communications.

### THE WIDAL REACTION IN MILITARY LABORATORIES. A SUGGESTION.

BY MAJOR C. J. H. LITTLE, O.B.E.  
*Royal Army Medical Corps.*

It is the duty of the pathologist, when reporting laboratory findings for the consideration of the clinician, to express his opinion of their probable significance. Of tests in common use in military laboratories, the interpretation of Widal's reaction, though theoretically so simple, is possibly the most difficult, due to the presence in nearly all military patients of agglutinins formed as a result of anti-enteric inoculation, and unhappily also to the fact that we do not always find in an enteric infection the rise in specific agglutinins we feel entitled to expect. This is illustrated in Table I, a series of Widal tests made in a case from whose blood *Bacillus typhosus* was isolated, and who suffered from two relapses.

TABLE I.  
Figures denote number of standard agglutinin units.

Days of illness	T	A	B	C
6th .. ..	3	17	36	29
16th .. ..	3	17	36	20
Interval of 3 weeks, followed by relapse.				
34th .. ..	179	17	40	29
41st .. ..	179	14	47	17
51st .. ..	171	16	86	23
Interval of 1 week, followed by relapse.				
69th .. ..	120	17	59	21
77th .. ..	397	17	83	38
84th .. ..	448	15	52	17
100th .. ..	1,985	17	51	33

Neither the tests during the primary attack, nor those during the first relapse, gave any indication of a specific infection, except a misleading rise in agglutinins for *B. paratyphosus* B.

It is, of course, well known that in a case of suspected enteric in an inoculated individual, a single estimation of the agglutinin content, taken at whatever period of the illness, supplies no data on which to base a diagnosis. Agglutinins of the enteric group of organisms present during the first week of illness are residual, the result of inoculation, and vary in amount with the individual response to the vaccine, the antigenic properties of the different strains of organisms composing the vaccine, the lapse of time since inoculation, etc. After the first week's fever in an enteric infection, stimulation by the infecting organism adds to the residual agglutinins, but without measuring the total amount present on at least two occasions with an interval between of some days, it is impossible to say whether the whole is residual or part is due to the specific stimulation. Even in uninoculated patients it is safer to carry out two tests, especially in India, since it is often impossible to exclude with certainty a previous enteric infection. That a single test which shows a disproportionately high number of agglutinin units for one organism in no way points to the probability of an infection with that organism is shown in Table II, in which are given the results of tests made in diseases other than enteric fevers.

TABLE II.

Disease	S.A.U.				
	T	A	B	C	
Bronchitis .. ..	862	12	62	0	
Pneumonia .. ..	17	16	122	0	
Pyæmia .. ..	173	31	11	0	
Lymphadenitis, acute ..	759	31	0	5	
Malaria .. ..	500	13	29	0	

Widal's test is performed in all military laboratories in India by Dreyer's method, using Dreyer's apparatus, Oxford standard laboratories emulsions, and as a rule a water bath heated by an oil lamp. Results are expressed in standard agglutinin units (S.A.U.). In this laboratory the water-bath is in a specially constructed draught-free chamber, yet the temperature of the water varies from day to day, and even during the two hours of the test, through several degrees. The whole apparatus is in perfect condition, but no amount of care has yet succeeded in regulating it more accurately, and it is probable, therefore, that other workers' water baths behave in the same manner. The depth of water in the bath may not always be quite the same, the temperature and humidity of the air in the laboratory vary with the weather, and lead to more or to less rapid evaporation, and so the identical conditions under which at least the first two Widal tests in a suspected case should be carried out are lacking, or at any rate cannot be assured. Agglutination is, to a large extent, a physical phenomenon, influenced by physical conditions, and affected, when measured by Dreyer's

method, by any variation in the relative amounts of tube, or rather mixture in the tube, in water and in air, and of the difference between the temperature of the water and the air. Then, too, a further slight difference between two readings may arise from estimating the same degree of agglutination on one day as, for instance, "tr. +," and on another as "tr." only.

It may be argued that variations due to the above causes will be so slight as to give rise to no error of diagnosis. The following series of readings from cases other than enteric fevers show that, whatever the causes may be, the variations do arise, and it is not possible to say how much of the rise or fall in agglutinins was due to the disease and how much to alterations in the conditions under which each test was made:—

TABLE III.

		Heat exhaustion			Rheumatism			Lymphadenitis			
		T	A	B	T	A	B	T	A	B	C
1st serum	..	86	62	141	172	62	125	759	31	0	5
2nd "	..	97	31	71	34	12	62	500	13	29	0
3rd "	..	76	31	35	172	70	125	..	..	..	..

Any method, then, by which differences in readings due to causes other than actual changes in agglutinin content of the serum are eliminated will help us towards acquiring a knowledge of the behaviour of agglutinins in both enteric and non-enteric infections.

With this object in view, sera from inoculated patients were divided into two portions, one being tested immediately by Dreyer's method, the other being placed in the ice-chest for seven days and then tested. The two results nearly always differed, but it was found that serum did not lose in titre by keeping in this manner.

Blood was then taken three times, at weekly intervals, from a healthy volunteer, inoculated six months previously, whose agglutinin content was therefore presumably stable. The first serum was tested the day after the first blood was taken, No. 2 serum was tested with No. 1 on the day after the second bleeding, and No. 3 with No. 1 and No. 2 on the day after the third bleeding. The results are shown in Table IV:—

TABLE IV.

Date of test:		March 9, 1927				March 16, 1927				March 24, 1927			
		T	A	B	C	T	A	B	C	T	A	B	C
Serum No. 1	..	156	8	64	0	137	9	49	0	156	9	76	0
" "	2 ..	..	..	..	..	137	9	49	0	156	9	76	0
" "	3 ..	..	..	..	..	..	..	..	..	156	9	76	0

The tests and readings were carried out by the same worker, who has made over 1,000 tests by Dreyer's method during the last two years, and it is reasonable therefore to exclude the personal factor as the cause of any appreciable difference between results. It will be noted that serum No. 1 gave a different reading on each occasion, as did serum No. 2, but that sera tested together on the same day and under identical conditions gave the

same readings, thus proving that the varying results were caused, not by any changes from week to week in the amount of agglutinins present in the serum, which was obviously the same throughout, but by changes in the conditions under which the sera were tested.

It was possible, however, that the newly-formed agglutinins in an enteric infection might not, like those in an individual inoculated some time previously, remain at one level for seven days in the separated serum. As no such case was available for trial, one was simulated by injecting a volunteer with T.A.B. vaccine. The sera, taken and examined as in the case of the first volunteer, gave the following readings. Owing to the rising titre, no accurate comparison of tests was possible, but it appeared that little change occurred in such a serum kept in the dark at about 0° C. for seven days. Did any change occur in serum from an actual enteric case, it would be a fall in agglutinins, and would only emphasize any rise in the specific agglutinins in blood taken some days later :—

TABLE V.

Sera—	Serum 1				Serum 2				Serum 3				Serum 4			
	T	A	B	C	T	A	B	C	T	A	B	C	T	A	B	C
1. Before inoculation	0	0	20	5	..	..	..	..	..	..	..	..	..	..	..	..
2. Five days after 0.5 c.c. T.A.B.	0	0	24	0	0	35	72	0	..	..	..	..	..	..	..	..
3. Seven days later (five days after 1 c.c. T.A.B.)	..	..	..	..	0	38	78	0	0	806	1,562	0	..	..	..	..
4. Twelve days later	..	..	..	..	0	28	65	0	0	750	1,766	0	0	806	781	0

As in Table III, slightly different readings were obtained with the same serum tested on different days.

The entire absence of response to T antigen cannot at present be explained.

The results of these experiments were then applied to actual suspected enteric fevers.

A knowledge of the agglutinin content of the first specimen of serum from such a case being admittedly, by itself, of no value to the medical officer in charge of the patient, since he does not know if there is a rise against one organism, the first serum received was placed untested in the ice-chest until a second should arrive some five to seven days later.

The two were then put up together under identical conditions, and any

difference in reading between them was known to be a true difference, and not due to the outside factors referred to. If a second serum was not received, this showed that an enteric infection was no longer suspected, and there was consequently no need to test the first. In this way the clinician lost no help from the laboratory, since the first Widal test would have been of no use to him, and, while able to compare the two tests as soon as he could have in the old way, gained in the knowledge that any variation in the patient's agglutinins had been measured as accurately as possible, and was caused by the illness and by nothing else.

This method gave the laboratory worker a feeling of absolute confidence in interpreting results, but met with disfavour elsewhere, and was consequently restricted to cases from which a sufficient quantity of serum was received to allow of a portion being retained and tested with the second specimen. In practice it was found so satisfactory that it appeared worth bringing to the notice of all military laboratories, with the suggestion that it be generally adopted. Its value on occasions was recently well proved, when a second serum showed a distinct rise in S.A.U. for *B. paratyphosus* A as compared with the first. The first serum, however, was put up with the second and gave a similar rise, and the emulsion was found to be at fault. Had the second serum been tested alone, a diagnosis of "probable paratyphoid A fever" would have been made.

---

# REPORT ON THE INFLUENZA EPIDEMIC AMONG THE TROOPS OF WOOLWICH GARRISON DURING THE WINTER 1926—1927.

BY CAPTAIN R. R. EVANS,  
*Royal Army Medical Corps.*

"No one has yet succeeded in achieving either a satisfactory definition of what is meant by influenza or a description, far less a regulation, of the usage of the word. . . . No real advance can be made in our science unless the relativity of our concepts is first admitted, and no useful

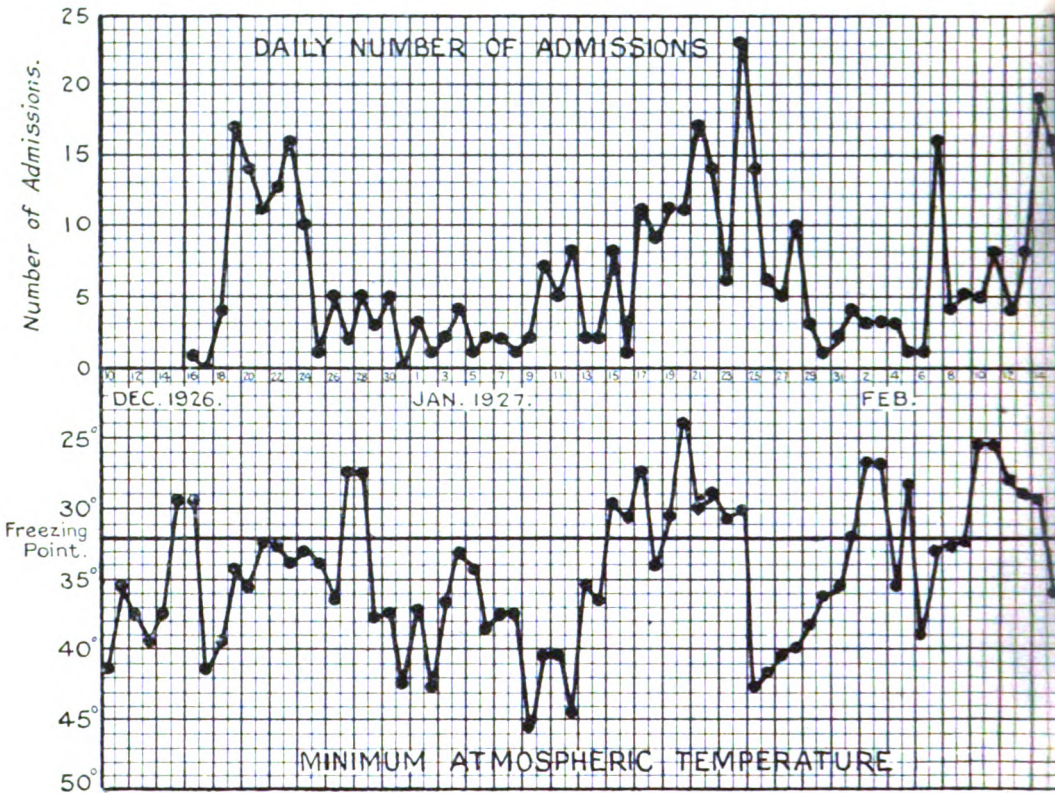


CHART 1.

concepts can be found unless the happenings are first observed patiently, separately and collectively."<sup>1</sup>

It is a well-known fact that epidemics of influenza vary considerably in extent and severity; that some countries are affected differently; that different parts of any one country may be affected in varying degrees, and

<sup>1</sup> F. G. Crookshank, "Influenza: Essays by several authors."



some communities more than others. Therefore, unless details are recorded of how any one community suffers, and to what extent the country suffers, no true picture can be formed of an epidemic as a whole and no advance can be made in our conception of influenza. In this report an endeavour has been made to record, as accurately as possible, the result of observation of the cases admitted into hospital from the Woolwich garrison of some 4,700 troops, and to note a few facts concerning the cases collectively and the epidemic generally.

The epidemic commenced with almost dramatic suddenness during the third week of December, 1926, and lasted up to the middle of April, 1927. During this time a total of 667 cases were admitted, and in addition nearly

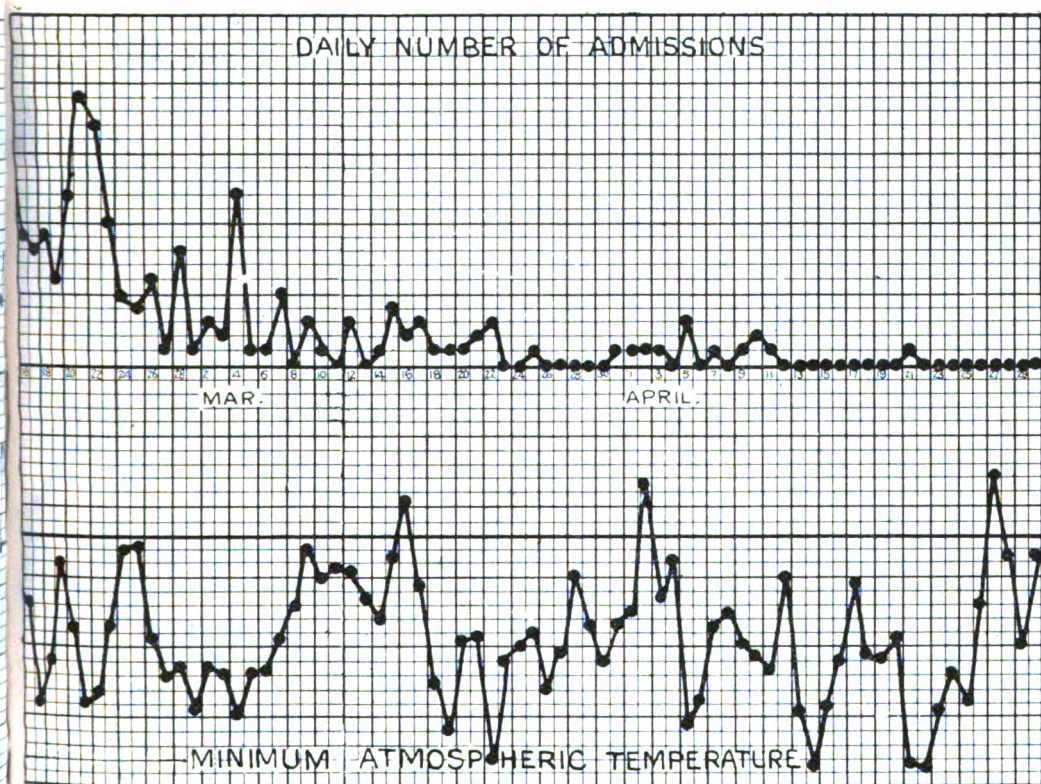


CHART 1 (continued).

100 cases were transferred from other districts. The first case was admitted into the Royal Herbert Hospital on December 16, and was quickly followed by many more cases, evincing the fact that the disease had broken out in epidemic form. The first few cases all belonged to the same battery of artillery and occupied two adjacent barrack rooms. These first cases were all characterized by suddenness of onset, severity of symptoms and marked prostration; they had all been attacked only a matter of a few hours before



admission into hospital. Within a week of its commencement the disease had spread to other units, but the degree of severity of the symptoms, which was so noticeable a feature at first, was less marked later.

Chart 1 shows the daily number of admissions throughout the epidemic. When an allowance is made for the "spikiness" of the curves, which is due on the one hand to a dislike on the part of the soldier to reporting sick on Saturdays and Sundays, and on the other to an abhorrence of the Monday morning feeling—the astounding feature of this curve is the presence in it of waves. Chart 2 shows the number of admissions for the same period by the week—the human element here excluded, the waves are more marked still. Influenza, in common with other respiratory diseases, is increased in its prevalence during cold and frosty weather. Chart I shows the very intimate connexion that exists between minimum atmospheric temperature prevailing and the occurrence of cases of influenza.

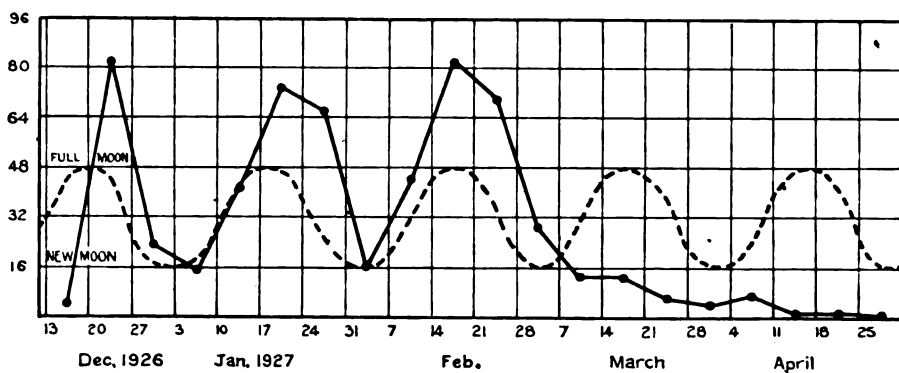


CHART 2.—Weekly admissions of influenza and phases of the moon.

For ease of comparison the minimum temperature curve is shown immediately below the admission rate, but in the reverse way to which temperature is usually recorded, i.e., a fall being shown as a rise on the chart. It will be noted that a fall below freezing point in the temperature is followed on nearly all occasions by an increase in the number of cases admitted. The only notable exception to this occurs between Christmas and January 1, but as the great majority of the men were on leave during this period, it can hardly be called an exception, as possibly in other parts of the country the temperature was not as low as that recorded at the Greenwich Observatory, whence these figures were obtained.

Barometric pressure and humidity curves also bore a relation to the admission curve although not as close as that of temperature.

Chart 2, in addition to showing the weekly number of admissions, shows the lunar phases during the course of the epidemic. There is undoubtedly here also a very close relationship presumably brought about through the medium of the weather. Whether such close relation-

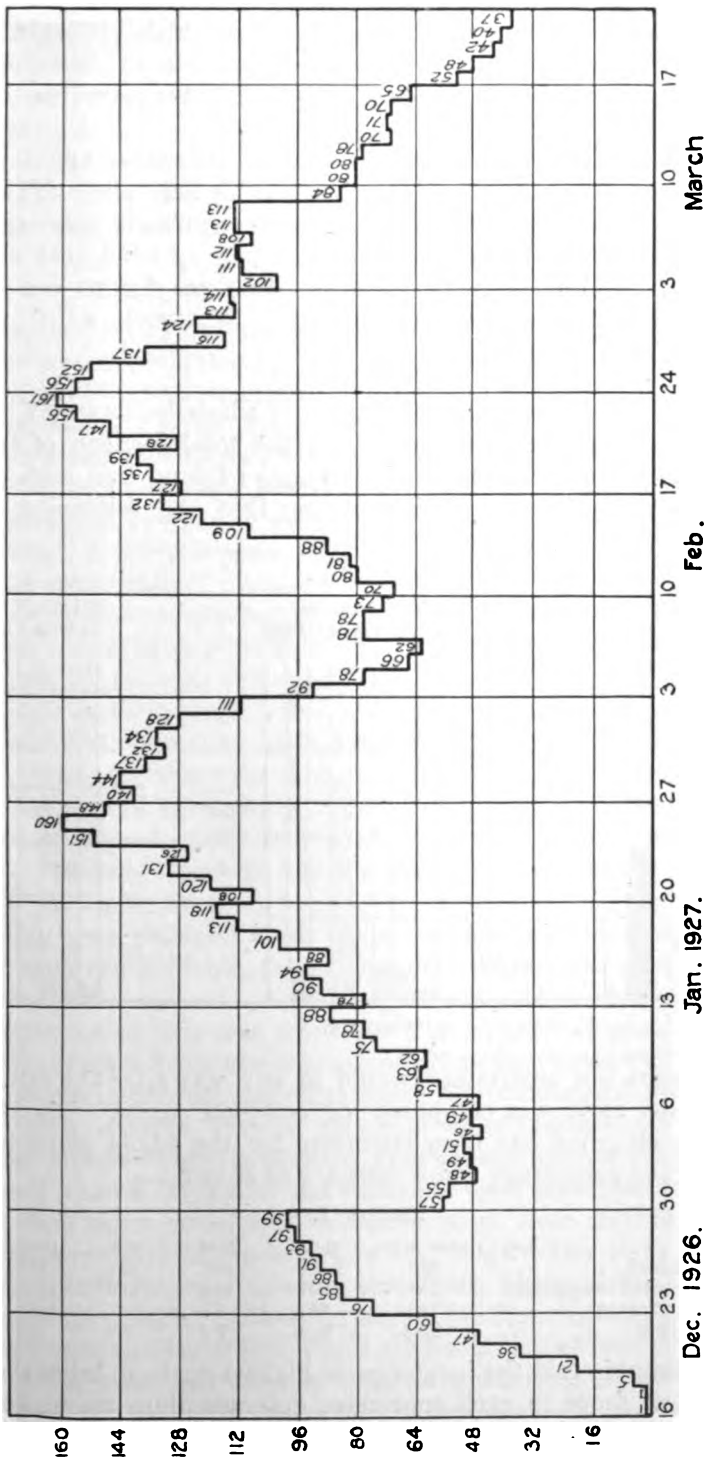


CHART 3.—Daily Hospital state of influenza.

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ship exists in other epidemics is doubtful and would be difficult to prove except where records are kept of cases as they occur. Unfortunately the returns of the Registrar-General are of no value in this respect as influenza is not a notifiable disease.

Chart 3 shows the daily hospital state of influenza, and the waves characteristic of the epidemic are very noticeable here also. This chart, although of little value at the termination of the epidemic, was very useful during its course when it was necessary to open up additional wards for the accommodation of increased numbers. In these figures are included about 100 cases admitted from districts outside Woolwich.

#### AGE INCIDENCE.

As already mentioned, the total number of admissions was 667. Table I shows these divided into age groups. Of the total garrison of 4,703 the ages were ascertained in 3,443 and the number falling into each group is shown. There is no reason for believing that the remaining number

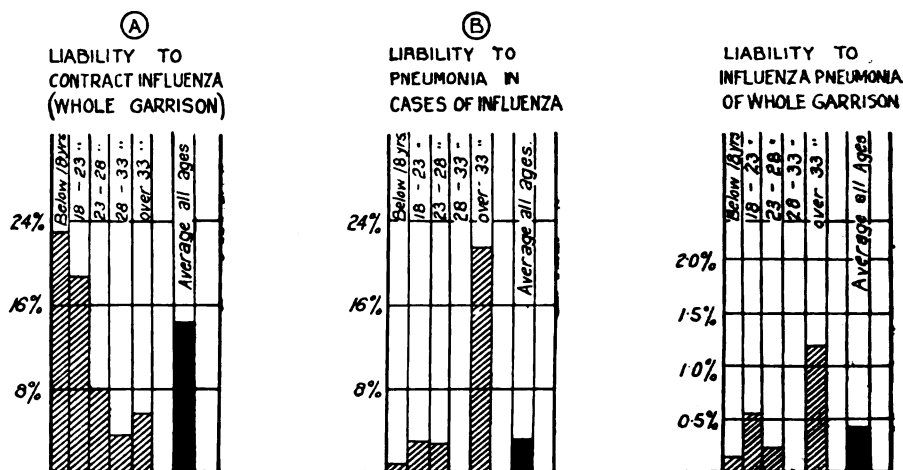


CHART 4.

whose ages were not ascertained would in any way alter the ratio of the various groups as it was composed of complete units. Therefore the number in each group has been estimated for the whole garrison, and of this number the percentage admissions are as shown:—

TABLE I.

	Ages :	Below 18 yrs.	11-23	23-28	28-33	Over 33	Total
Numbers ascertained ..	..	533	1,500	697	343	370	3,443
Numbers estimated in the garrison	..	728	2,049	952	469	505	4,703
Admitted with influenza ..	..	166	382	74	17	28	667
Percentage admitted ..	..	22.8	18.6	7.8	3.6	5.5	14.2

It is noticeable that the incidence is highest in boys below the age of 18, and that it drops in each successive quinquennium up to 33. Over 33 there is a slight increase over the preceding quinquennium. This is

shown in diagrammatic form in Chart 4. Naturally too much reliance cannot be placed upon these figures, when estimating the actual incidence of the disease, as many of the younger men were admitted, although the disease was comparatively slight; and in the case of the older men, many of whom are non-commissioned officers and some married, facilities existed whereby the milder cases could be treated out of hospital, which did not exist in the case of recruits and young soldiers.

#### TYPE OF DISEASE, SYMPTOMS AND COURSE.

In practically all cases the disease was of the respiratory type. It has already been mentioned that the first cases of the epidemic were characterized by the degree of prostration, etc. These cases were possibly more nervous than respiratory. Apart from these, a few out of the total presented marked prostration—of a peculiar type somewhat resembling that of typhoid fever—with more marked pyrexia, usually prolonged to about ten days. Gastro-intestinal symptoms were present in only a very small proportion of the cases. A few also were afebrile, but otherwise presenting the same symptoms as the rest.

The symptoms complained of chiefly were headache, cough, soreness of the throat, aching of the limbs and back, pain over the front of the chest and general malaise. At the commencement of the epidemic the onset was abrupt, later more gradual. The appearance of the patient on admission was almost characteristic. He presented a languid and irritable look, some suffusion of the eyes with a frowning forehead, the face usually rather flushed, and a harsh, irritating and persistent cough, occurring in bouts, which accentuated the headache and the general discomfort from which he suffered. Early in the disease there was little or no expectoration. If left alone, he soon became drowsy and as a general rule slept well except when wakened up by coughing or aching limbs and back.

The appearance of the throat was also characteristic in the majority of cases. There was œdema and hyperæmia of the pharynx and uvula, and in most cases this was marked. The uvula was peculiarly lax and elongated and often lying against the posterior pharyngeal wall. The tonsils usually shared in the general œdema and hyperæmia, and occasionally the follicles were covered with a yellowish-white deposit of lymph. The lymphatic glands of the neck were swollen and tender on pressure. In some cases rhinitis, laryngitis and tracheitis were predominant features.

The chest signs varied and in rather more than half of the cases no signs whatever could be made out in the lungs. The signs presented at first were usually those of an acute bronchitis, which in the milder type of case cleared up quickly. Others in which the bronchitis was more intense ran a more prolonged course and still others developed broncho-pneumonia. Some of these cases had definite signs of pneumonia on admission. The degree of variations in chest signs was remarkable.

The fever lasted mostly from two to four days. In a fair proportion of

cases the temperature came down on the second or third day after admission. Others went on for a week or longer. Several cases in which the temperature had fallen on the third or fourth day of the disease developed a sudden rise of temperature again on the sixth or seventh day, but this second rise rarely continued for more than a day. The charts of these cases closely resembled those of dengue fever. If bronchitis was marked, the temperature would be prolonged.

Headache, at first a common and troublesome complaint, was found to be amenable to treatment, and was not often complained of after the first day. In a few cases, however, it persisted for several days after the fall of the temperature, with no other apparent sign.

The pulse-rate in all cases was peculiarly slow. So much so that it was found to be of considerable value in diagnosis. There was hardly a case on first admission that had a pulse-rate of over 100, even though temperatures ranged to between 100° F. and 104° F. A temperature below and up to 101° F. would be accompanied by little or no acceleration in the pulse-rate. A slow pulse persisted throughout the course of the disease in the absence of complications, and in most of the cases of bronchitis, broncho-pneumonia and other complications, the proportionately slow pulse-rate was still apparent. When the pulse-rate became rapid it signified either the formation of pus or a cardiac involvement. Apart from the slowness of the pulse there was nothing else particularly noticeable. Irregularities were seldom encountered.

Skin rashes were by no means uncommon and were usually of the general erythematous type affecting the trunk and limbs. The erythema varied in degree from a mild form to a generalized scarlatiniform eruption. This symptom often gave rise to great difficulty as several cases of scarlet fever occurred during the course of the epidemic, and some amongst patients in hospital with influenza.

The appearance of the tongue which has been described in influenza was not noticed in the epidemic. The sputum varied considerably; the greenish-yellow described by Pfeiffer being exceptional. Its quantity and appearance depended upon the degree of involvement and site of the main affection. It formed a useful guide as to the condition and progress during convalescence.

#### COMPLICATIONS AND SEQUELÆ.

First and foremost among the complications was *pneumonia*, and this disease with its further complications was responsible for practically all the severe cases throughout the epidemic. Twenty cases were recorded, and both the lobar and lobular type were noticed, but the latter type was much the commoner. The rusty sputum and temperature falling by crisis, together with the usual clinical signs, were, however, present in two or three cases, so this type had to be looked upon as lobar. The pneumonia in some cases was ushered in early in the course of the influenza, others

had been under treatment either in or out of hospital for a number of days, and in one case of a rather severe, but short, attack, the temperature fell and remained normal for two days before pneumonia developed. The pneumonia, however, was an extremely severe form of the fulminating type, and the patient died within thirty-six hours. This was the only case of this type which was so common in the 1918 epidemic.

In the case of bronchopneumonia the onset was insidious or abrupt, with a sudden stabbing pain in the side, accompanied by a sudden rise in temperature. This type of case usually showed an area of pleural rub in the neighbourhood where the pain was complained of, and it was noticeable how often this particular area happened to be in the axilla—more often the right, over the area of the middle lobe. The right middle and two lower lobes were the areas chiefly affected by bronchopneumonia, and no case was encountered of upper lobes being affected without the lower lobes. The course of the pneumonia was variable, but usually prolonged, with temperature falling by lysis. In several cases the temperature remained elevated for nearly three weeks, and there was profound emaciation and debility.

Two fatal cases occurred during the epidemic, and pneumonia was responsible on both occasions.

Table II shows the cases of pneumonia divided into age groups similar to Table I. It also shows the liability to influenzal pneumonia in the various groups in the garrison (C), and to the development of pneumonia in cases of influenza (B). The remarkable feature of this table is the greatly increased liability to pneumonia in those over 33 years of age, and the still greater liability in cases of influenza over that age. This is shown more clearly in Chart 4.

TABLE II.

	Ages :	Below 18 yrs.	18-23	23-28	28-33	over 33	Average
Number of cases of pneumonia	..	1	11	2	0	6	20
Percentage of cases of influenza developing pneumonia		0.60	2.88	2.70	0.00	21.43	3.00
Percentage of number in Garrison developing pneumonia		0.14	0.54	0.21	0.00	1.19	0.43

*Pleurisy, Pleural Effusion and Empyema.*—Dry pleurisy was found both alone and accompanying bronchopneumonia. The commonest area affected was in the axillary line. It invariably commenced suddenly with a rise of temperature and a sharp stabbing pain. The usual signs were present, and the rub in some cases was distinctly palpable to the hand. These cases did well; the symptoms passing off almost as quickly as they arose and the temperature subsiding.

Two cases of pleural effusion were encountered. In both cases the diagnosis was confirmed by radiography. In one case the effusion was large and had to be withdrawn on several occasions in order to relieve the dyspnoea. In both cases the fluid withdrawn was sterile. Empyema

developed in only one case. The pus contained pneumococci and staphylococci, but no streptococci. Seven ounces of pus were withdrawn, but as no improvement followed he was operated upon four days later when a further ten ounces were evacuated. Good recovery followed. Both the cases of pleural effusion and empyema supervened upon attacks of bronchopneumonia.

*Bronchiectasis*.—One case was met following bronchopneumonia; large quantities of pus were coughed up for many days. Good recovery followed.

*Suppurative Tonsillitis*.—This was a common complication and in some cases was of a very severe character. Two cases developed a lymphatic exudation in the fauces and were suggestive of diphtheria, but this disease was excluded on bacteriological evidence. A few cases developed peritonsillar abscess.

*Laryngitis*.—This was frequently met, even in otherwise mild cases, and was usually resistant to treatment.

*Epistaxis*.—This was also fairly common and in most cases was accompanied by rhinitis.

*Tachycardia*.—This was a troublesome complication in one case. Recovery was slow, but eventually took place after prolonged rest in bed.

*Arthritis*.—Arthritis of the small bones of the wrist was met with in one case, but it was of a mild degree, and quickly cleared up without any special form of treatment.

*Acute Suppurative Otitis Media*.—This developed in two cases, neither of which gave a previous history of the disease.

*Boils and Abscesses*.—These were common, staphylococci being the infecting organism in these as well as in the previous affection.

*Herpes Labialis*.—This was fairly common, occurring chiefly in cases that had developed pneumonia.

*Asthma*.—This developed in one case which had been discharged from hospital three days previously on recovery from influenza. He gave no previous history. No special form of treatment was adopted and he recovered quickly.

#### BACTERIOLOGY AND PATHOLOGY.

This part of the work was undertaken in the laboratory attached to the Royal Herbert Hospital.

At the commencement swabs were taken of the throats in all cases, and these were examined microscopically. Staphylococci and streptococci were present in all smears, pneumococci and Pfeiffer's bacillus in the majority and *Micrococcus catarrhalis* in some. As it was felt that no useful purpose was being served by this procedure it was later on discontinued; the swab only being taken to exclude diphtheria in cases that were in any way suspicious. A large amount of other work was, however, done. The urine was subjected to routine examinations in the majority of cases, and in seventeen

cases, mostly the more severe kind that had developed bronchopneumonia, the percentage of chlorides was estimated in the urine. The average worked out at sixty-six milligrammes per ten cubic centimetres.

White blood-counts were made in a number of cases without complications and in cases complicated by bronchopneumonia. The average worked out as follows :—

	Uncomplicated cases	Complicated
Total .. ..	8,280	13,252
Polymorphonuclears .. ..	54	75
Lymphocytes .. ..	39	21
Large mononuclears .. ..	4	3
Eosinophils .. ..	2	1
Basophils .. ..	1	0

The sputum was examined in many cases with a result similar to those of the swabs taken from the throat. In seven cases the pneumococci present were typed with the following result :—Type I, *nil*; type II, 4; type III, 1; type IV, 2. In addition many other specimens of various kinds were examined at various times.

#### RADIOGRAPHY.

Considerable help was obtained from this method of examination in doubtful conditions of the chest, and whenever any doubt was entertained the patient would be examined by this means. It was found extraordinarily useful in watching the progress of the chest during convalescence.

#### TREATMENT.

*Prophylaxis.*—Preventive inoculation was practised on a small scale at the commencement of the epidemic. A chart kept showing admissions by units showed a slight increase in the numbers admitted during the week following inoculation, but diminution during the rest of the month following. After a month had elapsed inoculation appeared to have little or no effect. The amount of vaccine required to inoculate the whole of the garrison would, of course, be considerable, and more than was available. For this reason, when the supply became limited, the plan was adopted of inoculating newly joined recruits only. This procedure made it difficult to keep any form of record of the inoculated cases for comparison with the uninoculated. It is believed, however, that complications were not as common in those who had been inoculated as in those of the same age who had not been inoculated.

In addition to inoculation other prophylactic measures were taken, such as the observance of proper ventilation of barrack rooms and institutes and the early isolation in hospital of the infected cases. Gargling and nasal douching were also practised as a daily routine amongst the troops. A solution of potassium permanganate 1/4000 was the one commonly used, and when carried out thoroughly and persevered with, it is a measure which is believed to reduce the incidence of infection.



*Curative Treatment.*—A routine treatment was adopted at the commencement and carried on throughout the epidemic. It was found to have a profoundly beneficial effect upon cases and consisted of the administration of the following: Calomel, 3 grains on admission; mist. expectorans sedativus and potassium permanganate gargles four times a day; pulv. ipecac. co., 10 grains on the evening of admission; magnesium sulphate (as required) the following morning; tinct. benzoin co. (one drachm to one pint) inhalation morning and evening. Pulv. ipecac. co. or aspirin would be ordered specially on the second or on successive days as found necessary. When the character of the cough and expectoration warranted it, the sedative expectorant mixture would be discontinued and replaced by mist. expectorans stimulans. The inhalations were continued until the expectoration ceased. When the temperature had been normal two or three days and the tongue had cleaned up Easton's syrup was given three times a day. The value of the treatment could easily be gauged by comparing the relatively calm and comfortable patient with his condition on admission twenty-four hours previously. Various writers have stressed the value of opium in influenza and state that its effect may almost be considered to be specific. The experience gained in this epidemic has gone all in favour of this claim, and there is little justification for withholding it once the diagnosis is made and there are no *contra*-indications. The inhalations were also found to be very beneficial.

The composition of the mixtures used is as follows:—

<i>Mist. expect. sedativus.</i>					<i>Mist. expect. stimulans.</i>				
R	Tinc. camph. co.	..	..	℥ xv	R	Ammon. carb.	..	..	gr. v
	Vin ipecac.	..	..	℥ x		Liq. ammon. acet.	..	..	℥ ii
	Oxymel scillæ	..	..	℥ ss.		Vin ipecac.	..	..	℥ x
	Aquam ad	..	..	℥ i		Aquam ad.	..	..	℥ i

In conclusion, I desire to express my gratitude to Colonel J. A. Hartigan, C.M.G., D.S.O., K.H.P., R.A.M.C., for the facilities afforded me during the epidemic and for many excellent suggestions and advice at various times; to Major S. Smith, R.A.M.C., for his guidance and assistance in supplying details after my departure from Woolwich; to the Staff of the Laboratory and the Radiological Department and to members of the Q.A.I.M.N.S. and N.C.O.'s, and Other Ranks of the Royal Army Medical Corps who served in my wards at various times and without whose assistance this record would not have been possible.

## EVACUATION IN A WAR OF MOVEMENT.<sup>1</sup>

BY LIEUTENANT-COLONEL GARBOWSKI.

*Polish Army Medical Service.*

### I.—GENERAL CHARACTERISTICS OF THE MEDICAL SERVICE IN A WAR OF MOVEMENT.

In nearly all phases of war we see that military action is composed of two principal factors: fire and movement, for by either of these the enemy can be defeated. The relative proportion of these two fighting factors is not always the same. When one attains its maximum intensity, the other decreases in importance. In fact, the effort by fire demands careful preparations in the given sector, a collection of war material, organization of the ground, etc. Once this is set working, the fighting front moves very little, since the adversary also organizes the ground, and the fighting area becomes defined. The front becomes stabilized in general when the density of the troops engaged is great and when the adversaries are well supplied with war material. In cases where the front is very extensive in proportion to the effectives engaged, or the war material is not so great—the factor of movement dominates the struggle.

The proportion between these two factors, mentioned above, is of primary importance for the medical service and gives a characteristic impress to its action. When the fire factor dominates and there are little or no fluctuations of the fighting line, the medical services will have great numbers of wounded, but should be able to bring up their medical units close to the line and thus facilitate the transport of these wounded. On the other hand, when the factor of movement preponderates, the transport becomes more difficult and the action of the medical service assumes a special character. Generally speaking, the casualties in this case are fewer, but the question of transport is more difficult on account of the distance of the medical units, destruction of the lines of communication, and threats to these lines from enemy movements.

The experience of the Polish Medical Service is based upon the actions which took place in a country with a poor road system, the effectives engaged being distributed over a comparatively large area.

### II.—GENERAL PRINCIPLES OF THE ORGANIZATION OF THE MEDICAL SERVICE IN THE FIELD.

Oscillations of the fighting line and threats to the lines of communications by the enemy make it necessary for the medical units which are called upon to function near the fighting line to be light, mobile and capable of

<sup>1</sup> Translated from the Proceedings of the 4th International Congress of Military Medicine and Pharmacy held at Warsaw in June, 1927.

being rapidly installed. But the general principles of the organization of medical aid for the wounded remain the same as those which are applicable in a war with a continuous front and even in position warfare.

Before entering into the details of the organization and the functioning of the Medical Service, we will therefore sum up the essential data acquired during the experience of the Great War.

Evacuation consists in bringing the sick and wounded to establishments where they can be in comfort and receive the care required to cure a sick or wounded casualty in a normal time. Two kinds of difficulties confront the Medical Service: those due to the great number of sick and wounded, and those resulting from the distance of the medical units from the field of action.

Let us study these two difficulties.

In modern wars the nature of casualties has changed appreciably. Whereas the number of sick has gradually and very definitely diminished, thanks to preventive measures and the improvement of the well-being of the soldier in the field, enemy action, fire, gas, etc., have caused ever-increasing casualties. And this, despite the efforts which the higher command have made to protect the lives of the combatants, for the enemy has introduced ever-increasing means of destruction in the field. Hence the total number of casualties increases whilst the number of sick decreases. The statistics of the Great War published by the different countries are very explicit on this subject. They are well known, therefore we will not quote them, but will restrict ourselves to recalling the average figures, accepted by the majority of authors as the casualties of higher formations, such as infantry and cavalry divisions.

The Medical Service in Poland in 1918-20 on the Eastern front only had to deal with comparatively small casualties. When analysing them we find them analogous to those of wars prior to 1914-18. Rifle fire caused more casualties than shell fire during the war 1918-20 in Poland, and, at certain periods, the incidence of contagious diseases, especially exanthematous typhus, was very high. This is explained by the small number of effectives, the small amount of artillery at the disposal of the two adversaries, and the intensity of the epidemics which raged in the fighting zone. We will, however, base our report on the heavy casualties allowed by the authors who drew their data from the statistics of the Western Front.

For an infantry division of about 15,000 men, in four days' fighting, it was estimated that 1,400 to 2,000 men were put out of action, of whom thirty per cent were killed and missing. It must be understood that these casualties are very high—the result of a violent action carried out on both sides with a maximum effort. Although these figures were noted especially in position warfare, we think, nevertheless, that they should also be allowed in heavy actions in a war of movement. The intensity of fire is perhaps less in this case, but the absence of trenches, communication

trenches, and shelters, results in the rifle and shell fire causing heavier casualties. These casualties demand large means of transport.

With regard to the difficulties due to the distance from the battlefield, we must first ask ourselves the following question: For how long can a casualty stand transport to hospital without causing ill-effects to the wound and its after-treatment?

Now, the experience of the Great War, so well brought out at the Rome Congress by Surgeon-General Duguet, has shown that:—

(1) The great majority of war wounds become infected and this occurs in spite of the correct application of the first field dressing and despite a careful disinfection of the wound carried out on the battlefield. In practice every war wound is an infected wound.

(2) With a view to avoiding septic complications, all war wounds should be operated upon during the period which precedes their becoming septic. This period varies, according to the tissues concerned, from twelve to thirty-six hours on an average.

(3) No casualty should be sent to the base before being examined in accordance with modern surgical practice.

These general principles remain obligatory. They form the basis for the organization of our system of evacuation.

In order to be able to carry out its duties and satisfy surgical requirements, the Medical Service was reorganized in most armies during the Great War or else immediately afterwards. The broad lines of its organization are as follows:—

Large hospitals, which in some armies are called "*hôpitaux d'évacuation*," are established behind the lines at a distance enabling the wounded to be brought there in a few hours. The tactical higher formations to which they are attached vary according to the armies. They belong to the army corps, or more often to the army. These hospitals form clearing stations through which pass nearly all the wounded, gassed, and sick, who come from the front. Those whose condition does not permit of their being transported further, or those who, for military reasons, should be treated and kept in proximity to the front, are retained and treated there. Light casualties especially, both sick and wounded, can be sent back to the fighting line more quickly if they are treated near the front. The first surgical operation for a large number of the wounded takes place in these hospitals.

The rôle assigned to these "*hôpitaux d'évacuation*" necessitates their being large. The percentage of empty beds must be adequate to provide for unforeseen circumstances. These hospitals will not be provided with means of transport for their medical equipment, they can only be moved either by rail or by a large number of motor-lorries or horse-drawn vehicles. The "*hôpital d'évacuation*" will only be installed at a certain distance from the fighting line. Even in position warfare the small oscillations of the front and the danger from artillery fire will force us to place it at

thirty or forty kilometres from the front. Even if good roads and comfortable motor ambulances are available, this distance may be a trifle long for serious casualties which require urgent surgical treatment. Special hospitals nearer the fighting area must be created for these casualties. To facilitate their description we will call them "*hôpitaux de campagne*." They should be small for several reasons. Firstly, their situation in proximity to the front—eight to fifteen kilometres—renders them only serviceable for a small sector. Secondly, in an action where heavy casualties are involved, only serious cases which cannot be transported, the number of which is fortunately not large in proportion to the total number of casualties—seven to ten per cent—are treated in this hospital. Thirdly, these formations must of necessity be provided, especially in a war of movement, with their own means of transport for their medical equipment. Finally, they may very easily fall into the enemy's hands, therefore the loss in personnel and medical equipment must not be too great, if this should occur. Let us add further that "*hôpitaux de campagne*" should be organized in such a manner that they can be rapidly installed in a few hours. This is easier if the hospital is small.

In the different armies these hospitals have various names, such as ambulances, light surgical ambulances, "*hôpitaux de campagne*," etc., and they are attached either to divisions or to army corps.

The "*hôpitaux de campagne*" are connected with the "*hôpitaux d'évacuation*," and with the fighting units by a series of medical units whose duty it is to transport the wounded.

The transport should be organized in such a manner that the wounded can be under observation during the journey. Consequently the line of evacuation should be marked out by posts where the wounded are halted, and can receive care, food, etc. The above-mentioned posts are designated as "*postes de secours de bataillon, de régiment, de division*."

If we assume that surgical treatment is only possible in the stabilized establishments, "*hôpitaux de campagne*" or "*d'évacuation*," transport should only be of short duration. Therefore the Medical Service should have at its disposal rapid means of transport, and the quantity of this should be sufficient to avoid the wounded waiting at the "*postes de secours*" for lack of means of removal.

The scheme which we have just described can be adapted in its broad lines both to a war of position and a war of movement. Moreover, it is impossible to forecast beforehand whether the struggle will assume the character of a war of movement or a war of position. Position warfare may develop into a war of movement and vice versa. The organization should be flexible, elastic and capable of answering to the requirements of any aspect of the struggle. In a war of movement we observe continual changes which, in relation to the ground over which the action develops, the distances, the tactical condition of the action, our own losses or those of the enemy, provide us with a number of situations the full details of which it is impossible to foresee.

The methods of evacuation should always correspond to the situation. The quantity and the nature of the medical units intended to give temporary hospital treatment, as well as the nature and the quantity of the means of transport, should be very flexible with a view to meeting the requirements of any situation which may arise. The necessity of allotting to the higher formations large reserves in hospitals and means of transport should be well emphasized.

### III.—GENERAL PRINCIPLES GOVERNING THE ADMINISTRATION OF THE MEDICAL SERVICE AND MEDICAL TACTICS IN A WAR OF MOVEMENT.

The Directors of the Medical Service should always bear in mind: (1) The absolute necessity for tactical higher formations to preserve their mobility; (2) the influence on the Medical Service of sudden changes in the tactical situation; (3) the difficulties resulting from movements, losses, of a long and difficult transport. This should make them realize the need for not demanding heavy medical units which would risk overloading the convoy columns.

On principle only the minimum of medical units should be allotted to the higher formations. On the other hand the administration should have at its disposal numerous reserves and formations for treating patients, as well as transport units. The latter should be employed judiciously and, as it may be assumed that they will never be in excess, recourse should be made on every occasion when it may be possible to other vehicles not really belonging to the Medical Services but which are returning empty after having brought up rations and materials to the troops. For this purpose it is necessary for the Directors of the Medical Service to collaborate with headquarters and the commanders of the different services who have these means of transport at their disposal. Obviously, the details of this subject can only be visualized in relation to the general organization of the transport service in each army.

To make a good use of their reserves, the Directors of the Medical Service should be in perfect liaison, both with the smaller units and the different headquarters. This will enable them to make a general appreciation of the situation and adapt the work of the service to the situation on the fighting front.

We shall speak of liaison in the subsequent chapters of our report. Here we shall only emphasize the liaison with headquarters, for this liaison should make it possible for the Directors of the Medical Service to distribute their reserves judiciously in order to be able to bring them up where they are required at the right moment. In fact the judicious distribution of the medical units which form the reserves of the higher formations is of primary importance. It will only be possible if the medical officers possess a general military training, enabling them to make an exact appreciation of the situation, and giving them experience and intuition. If this training is lacking, the finest and the most perfect organization will be of no use.

We should find badly placed and inactive medical units on the one hand, and on the other, an enormous mass of uncared for and non-evacuated casualties.

If it is said that general tactics is an art, the same must be said of medical tactics.

With regard to the different phases of a war of movement, medical tactics should be based on the following principles :

(1) During a rapid advance, concentrate the transport units forward, avoid the scattering of wounded in small units, group the wounded abandoned by the higher formations, be prepared to overcome the numerous transport difficulties, place medical reserves in proximity to the fighting units.

(2) During the retreat, echelon the medical units in depth, evacuate the slightly sick and wounded rapidly, be prepared to replace the medical units and formations destroyed or taken by the enemy.

Whatever the form of the struggle may be, the Medical Service should always endeavour to assure to the wounded the treatment required by the exigencies of science. Consequently, even in a war of movement, the wounded should arrive in a short time at the surgical hospital.

The question arises : Can this principle be realized ? In a war of movement we must first visualize what will be the consequences for the Medical Service of the movements of the higher formations, that is to say, the movements of the medical units attached to these formations, either forward, or to the rear, or laterally. Finally, the security of these units must be provided for.

The movement of these higher formations, that is to say, the distance which they can cover in a given time, is actually dependent on different conditions. Fire power in a war of movement as in a war of position obviously plays a considerable rôle. A successful action, however unimportant, cannot be undertaken without being certain of having a sufficient quantity of ammunition and other war material. The higher formations (divisions) can only transport a limited quantity of war material in their convoys. Therefore divisions should maintain intercommunication and continuity between their administrative services and the corresponding services of the immediately higher formation, army corps or army. But as the administrative units are heavy in these higher formations, their movements are less rapid than those of infantry. Hence the mobility of the divisions is limited by the administrative units. This is of primary importance for us, for it enables the Medical Service to maintain continuity between its units throughout the different echelons. It must be understood that in this case we are referring to a division advancing in direct contact with the enemy. When the enemy is in retreat and offers no resistance, the advance may be more rapid, but then there are fewer wounded and the disposal of the sick and wounded will not present great difficulties to the Medical Service.

We shall certainly be faced with situations where the Medical Service will have lost touch with the higher formations, but happily these situations, so difficult for the Administrative Medical Officer, will be comparatively rare. We shall return to these situations later.

Let us now study the protection of medical units. The enemy acts by fire and movement. Fire is dangerous over a zone of several kilometres behind the lines. But it is, above all, machine gun and field artillery fire which is to be feared by the medical units. Long range artillery is less dangerous because, generally speaking, it concentrates its action on certain objectives which can be avoided by the Medical Service.

In a war of movement enemy manœuvres often threaten the medical units situated even far to the rear. It is true that the Geneva Convention compels the enemy to respect the wounded and the medical personnel, but the Medical Service must nevertheless endeavour not to abandon its units and its wounded except in very exceptional cases. Moreover, the enemy does not always respect the Geneva Convention; we Poles had a sad experience of this in 1918-20.

The line of evacuation will therefore be chosen in such a manner as to obtain the maximum security. The road taken by the higher formation in its approach march is not always the best protected. At times it may be necessary during the engagement to change the line of evacuation or modify the whole system of evacuation. These circumstances demand great foresight on the part of both headquarters and the administration of the Medical Service. To sum up, if in position warfare the difficulties arise mainly from the quantity of wounded and from enemy fire, in a war of movement the principal difficulties result not only from the large number of wounded and from enemy fire, but also from the movements of the fighting units and manœuvres of the enemy.

#### IV.—THE TRANSPORT OF CASUALTIES BETWEEN THE BATTLEFIELD AND THE "POSTES DE SECOURS DE 1RE LIGNE."

Here there are certain differences between position warfare and a war of movement. In the latter the transport is often more difficult, for, on account of the absence of communication trenches, the stretcher bearers are more exposed to the enemy fire. The distances are greater although this increase is not very appreciable. The "postes de secours de bataillon" should follow their battalions. A maximum distance should never be exceeded, for it is inadmissible to transport a casualty far without having ascertained his condition and given him certain medical treatment. Now medical treatment appears only possible at the "poste de secours." In position warfare the "postes de secours de bataillon" were in shelters, some even shell proof; in a war of movement they will at times only be protected against rifle fire by sandbags. We must also note the fact that, on account of the more frequent movements than in a war of position, it will be somewhat difficult to keep the company stretcher bearers informed of



the constant change of position of the "postes de secours." The organization of relays of stretcher bearers, similarly to a chain of runners employed in the intercommunication service, appears to be the most practical method.

The wounded will only be retained at the "poste de bataillon" as long as is strictly necessary. After any urgent dressing, and after being provided with the field medical card the casualty will be sent at once to the rear.

We think it advisable to emphasize the necessity of immobilizing fractures here, because inevitably the duration of transport will be longer than in position warfare. Granted that it is scarcely possible to think of a final immobilization, the "postes de secours de bataillon" should be liberally supplied with previously prepared material for fractures, of light construction and easy to handle.

After the "poste de secours de bataillon," the second stage of the transport commences, and the authorities controlling it change as well as the personnel carrying it out. The battalion medical officers (regimental) after having dressed their wounded have completed their work for the latter. The special units of the Divisional Medical Service are responsible for the further transport. This principle should be observed above all when the engagement is heavy and the distance is great. The divisional units responsible for the transport beyond the "postes de secours des bataillons" have different designations in various armies: divisional medical groups, medical companies, etc.—they exist in nearly all armies.

In some countries besides the "postes de secours des bataillons," "postes de secours de régiments" are provided, organized by the regimental medical officer who, with his own means, assures the transport of the wounded from the "poste de bataillon" to the "poste du régiment." We consider, however, that in a war of movement the installation of "postes de secours régimentaires" would be superfluous, and that the divisional service should clear the "postes de secours des bataillons."

#### V.—TRANSPORT OF CASUALTIES BY DIVISIONAL UNITS.

Thé rôle of the divisional unit responsible for transport would consist then in conveying the wounded from the "postes de secours des bataillons" or "régiments" to the "hôpitaux de campagne," or "hôpitaux d'évacuation." But it is only in rare cases that the medical company will be able to ensure the transport as far as the "hôpitaux d'évacuation." In the great majority of cases their work should be terminated at a much nearer point. From this point transport should be assured either by the motor ambulance sections, or by the horse-drawn medical column, or finally by hospital trains. In many cases the medical company will only transport the wounded as far as "postes de secours divisionnaire," beyond that point the transport will be effected by motor ambulances. Generally speaking it should be noted that it is essential always to define clearly the distance over which a medical unit is responsible for transporting the wounded. This distance should be limited. The commander of the medical company

cannot be held responsible for evacuations over a distance which, for instance, reaches to several tens of kilometres. The principle already referred to several times, that each director, each commander, should always look towards the front and clear the medical units which are nearest the fighting line, must always be borne in mind.

The medical company, a divisional unit, will be composed of medical personnel, hospital orderlies, stretcher bearers and horse-drawn vehicles; they will have at their disposal the necessary medical equipment to treat the wounded during transport, and rations and travelling kitchens to feed them. The number of vehicles will be limited so as not to encumber the division with long convoys. The medical personnel of this unit will also be responsible for carrying out the first classification of the wounded, gassed and sick, with a view to dividing them into two groups. Those who must be sent to the "*hôpital de campagne*" as urgent cases, and those sent directly to the "*hôpital d'évacuation*" as less urgent cases. This classification should take place at the "*poste de secours de la division*," organized by the medical companies.

The "*poste de secours divisionnaire*" will be situated near the fighting line at a point where the roads coming from the front converge. The necessity of selecting a locality more or less well covered from the view, bullets and shell of the enemy, must be borne in mind. In practice in a war of movement, this post might be situated at six to ten kilometres from the front line. As far as possible it should be installed in pre-existing shelters, farms, houses, factories, etc., rarely under canvas. Its rapid installation in two to three hours should be aimed at. Moreover, in case of danger the "*poste de secours*" must be able to retire rapidly.

The delicate point in the functioning of the medical company is the establishment of liaison with fighting units, such as infantry battalions. Both the commander of the medical company as well as the battalion medical officers must endeavour to establish this liaison, but in practice it must be recognized that it is particularly important for the battalion medical officer to be able to find the medical company. Therefore, it would be advisable to allot liaison personnel, cyclists or mounted despatch riders, to the battalion medical officers.

In a war of movement over an extensive area, one "*poste de secours divisionnaire*" will often not suffice. A subsector of the division might very well have a distinct line of communication and not be able to take advantage of the one "*poste de secours*" for the whole division. In other cases the "*poste de secours divisionnaire*" may become too far away, it would therefore be advisable to push forward advanced divisional dressing stations. This will make it possible to extend a section of the line of evacuation—"postes de secours du bataillon," "*postes de secours divisionnaire*"—without running the danger of breaking the continuity between these two posts. Therefore it is preferable to give such an organization to the medical company, that it can be divided into two or

three sections and that it can establish simultaneously two or three "postes de secours."

When the theatre of military operations is poor in road systems, motor transport should not be allotted to the medical company. The vehicles of this unit will have to approach the "postes de secours de bataillon" over bad roads or even across country. The radius of the vehicles of the medical company is limited to ten to fifteen kilometres at a maximum. In proximity to the enemy the motor vehicles cannot light their headlights at night, therefore, on principle, the motor ambulances should be kept for the transport over sections further away from the enemy. But it must be understood that, if circumstances permit, the motor ambulances will be pushed forward even up to "poste de secours de bataillon."

Track vehicles and six-wheeled vehicles, which have been much discussed lately, could render great services, the latter especially across country.

Before finishing with this part of the journey—"poste de secours de bataillon," "poste de secours divisionnaire"—a few words have yet to be said on the medical company and its posts at the moment of retreat. If a post is threatened an effort will be made to divert the stream of wounded to a more protected "poste de secours." At the same time all available means of transport should be sent to the threatened post with a view to removing at least all the slightly wounded cases.

We will now pass on to the part of the journey beyond the "poste de secours divisionnaire." Here the stream is divided into two—one of its sections, the larger, is sent to the "hôpital d'évacuation," the other, numerically smaller, to the "hôpital de campagne."

Let us now study the situation of this hospital, its organization, how it functions and how it is moved.

## VI.—"HÔPITAL DE CAMPAGNE."

From the standpoint of the requirements of medical treatment, it should be as near as possible to the battlefield. From the point of view of security, it should be as far as possible.

Generally speaking it is situated at a short distance from the "poste de secours divisionnaire." Its siting is dependent on a number of circumstances.

In an offensive which offers possibilities of success it is pushed forward. In retreat it is situated as far as possible from the front line. When good roads and comfortable motor ambulances are available, the hospital can be placed further away. The few extra kilometres which the casualty will do by car on a good road will not have a detrimental effect on his condition. Enemy movements must be taken into consideration. Finally, the question of buildings is of great importance. There should be no hesitation in placing it a few kilometres forward or to the rear, if by doing so a more comfortable situation can be ensured. It is indispensable that the hospital

should be rapidly installed, and in a war of movement, five to eight hours after its arrival it should be in a position to receive the wounded.

What will be the size of a "hôpital de campagne"? This problem should be solved by statistics. Taking into consideration the average proportion of seriously wounded cases in relation to the total number of wounded, and the fact that the division is withdrawn from action if it has suffered very heavy losses, we arrive at a theoretical number of beds corresponding to 0.7 per cent to 1 per cent of the total effectives of a division.

It is more difficult to estimate the surgical personnel required for a "hôpital de campagne." It is not possible to allot to this formation a number of surgical teams as permanent personnel for it is a well known fact that these hospitals, during long periods of a war of movement, are being continually moved without surgical work being required, and the number of skilled surgeons is always inadequate during a long war involving heavy casualties.

On the other hand at certain moments a "hôpital de campagne" may receive in a single day of a heavy engagement twenty-five to thirty serious cases coming from one division. Among these wounded there will be seventy per cent requiring to be operated on at once. Now a surgical team of a "hôpital de campagne" can only deal with eight to ten wounded a day.

The following solution of the problem might be adopted. Under normal conditions the "hôpital de campagne" has only one or two surgical teams. But at the next echelon, army corps or army, there is a reserve of surgeons, formed into teams of two surgeons each. Each of these teams has at its disposal its own means of transport (motors or aeroplanes), and its own material for the installation of an operating theatre. It generally works at an "hôpital d'évacuation." In case of need one (or several) of these teams will be sent to a "hôpital de campagne divisionnaire," where it will arrive rapidly, thanks to its means of transport. There it will work as long as there are wounded to be operated upon. Then it will return to the "hôpital d'évacuation" or else it may be sent to another "hôpital de campagne."

If we take into consideration the fact that, in modern warfare, the wounded represent the majority of casualties and that the treatment of the wounded consists in an early operation, special attention must be devoted in the field to the judicious employment of the skilled surgeons.

Bearing in mind that a surgeon only works well and rapidly if he is assisted by those with whom he is accustomed to operate, only formed surgical teams should be employed. On the other hand, the results of the work of these teams greatly depend on the conditions under which they are called upon to function. Therefore it is important to know whether to concentrate our surgical forces in the well-prepared large hospitals or disperse them amongst small "hôpitaux de campagne," badly installed in

immediate proximity to the battlefield. This question was widely discussed at one of the preceding international congresses, but here from the standpoint of our report this problem should be visualized slightly differently. In the employment of the surgical teams it is particularly essential to remember the rapidity of movement of the troops, the extent and depth of the fighting zone, as well as the conditions under which transport is effected.

Hence when the transport is long and difficult it will be impossible to send all the wounded to the main surgical hospitals. This will lead to the distribution of the surgical forces amongst the small "*hôpitaux de campagne*." In this manner a large number of wounded will be able to benefit from early surgical operations.

The Directors of the Medical Service in this case will be responsible for issuing orders in conformity with the military situation at the moment. As soon as the transport question becomes easier, the wounded should be concentrated in large hospitals ("*hôpitaux d'évacuation*").

Taking into consideration that a case, after an operation, is often unfit for transport for some time, small groups of wounded will be dispersed almost everywhere behind the front. Later on it will be necessary to re-group them and transport them to the rear. Obviously this will produce a somewhat difficult situation for the Medical Service and forms yet another argument against the dispersion of the surgical forces. Therefore this dispersion will only take place when in reality there is no other alternative.

It is advisable to note the fact that surgeons have a tendency to employ only the surgical method with which they are conversant and which they usually adopt. They are often inclined to carry out standard operations without taking into account the influx of wounded and the necessity of looking after everybody. And yet it is well known that the same result can often be obtained by simpler operations. In many cases the surgical treatment will only be completed in the rear in a better equipped hospital.

Hence the scheme of surgical treatment will have to vary according to the greater or smaller influx of wounded and according to the number of surgeons.

The Directors of the Medical Service cannot directly control the operating methods adopted by the surgeons. This duty devolves upon the consulting surgeons, that is to say the scientific authorities, the professors of the faculty.

The question arises as to how the "*hôpitaux de campagne*" which house the wounded incapable of standing the journey can be moved. If the division has advanced ten kilometres, its "*hôpital de campagne*" installed the first day of the action becomes useless for this division, as far as a hospital for serious cases is concerned. In this case a hospital which cannot be moved passes to the next echelon: the army corps or army. In exchange the division may receive another hospital drawn from the army reserves, which, having no wounded, will therefore be able to follow this division in its movements.

Let us note the fact that the question of "*hôpitaux de campagne*" is excessively difficult to solve in a war of movement. The carrying out of the interchange described above necessitates a large number of "*hôpitaux de campagne*" being always in readiness. At the same time it is impossible to deprive a large number of wounded of their only chance of recovery, that is to say, the possibility of immediate surgical treatment.

Another solution of this problem might be adopted.

The "*hôpitaux de campagne*" might be organized in such a manner that they could be divided into two or three sections. One section could remain on the spot, whilst the other two would follow the division. However, here again there are certain drawbacks, due to the fact that it would then be necessary to increase the administrative personnel of the hospital. Finally, the separated sections would risk not being able to join up again.

In the future this question might be solved by means of medical aeroplanes. The civil aeroplanes requisitioned could be concentrated at the army echelon for the purpose of effecting the air transport of the seriously wounded from the "*postes de secours divisionnaires*" to the hospitals situated fairly far from the front. Seriously wounded cases stand this mode of transport very well, and as their number is not excessive there would undoubtedly be no difficulty in collecting a sufficient number of aeroplanes for this task.

#### VII.—THE TRANSPORT OF WOUNDED BETWEEN THE "*POSTE DE SECOURS DIVISIONNAIRE*" AND THE "*HÔPITAL D'ÉVACUATION*."

We must return to the "*poste de secours divisionnaire*" to follow the disposal of the wounded who are to be sent direct to the "*hôpital d'évacuation*." This journey is sometimes so long that the railway will be used as soon as possible. At the nearest railhead to the battlefield an entrainment post should be organized for entraining those to be evacuated. We will call this post, to facilitate its description, "*station d'évacuation*." Obviously, the distance which separates this station from the "*poste de secours divisionnaire*" may sometimes be great: 40, 50, 60 kilometres and even more in the event of destruction of the railway line. The medical company cannot be responsible for evacuations over such an extensive area.

In this case two solutions present themselves: (1) To organize rapid transport by motor ambulance; (2) to create surgical centres not on the railway.

These centres would carry out the rôle of "*hôpitaux d'évacuation*."

In the first solution, the Directors of the Medical Service of the higher echelons: army corps or army—who would employ the motor sections kept in reserve—would be responsible for this transport.

In cases where the distance which separates the battlefield from the "*hôpital d'évacuation*" is so great that the wounded cannot arrive within twenty-four hours, in spite of the employment of motor ambulances and

hospital trains, temporary surgical centres should be installed off the railway.

These centres can be organized by the army corps or army by grouping several "*hôpitaux de campagne*." This solution has the advantage of allowing for the rapid installation of the first hospital, which will commence to work whilst the other hospitals arrive successively and gradually reinforce this temporary surgical centre.

#### VIII.—"*HÔPITAL D'ÉVACUATION*."

In a war of movement over an extensive area, this will be placed far from the front at a railway junction—at 80, even 100 kilometres from the first line. At the railway station of the town where this hospital functions a classification post will be organized. The wounded, sick and gassed coming from the front by train will be detrained, carefully examined, after opening dressings, as far as possible, and divided into categories. Those whose condition claims the most urgent treatment will be immediately sent to the receiving authorities of the "*hôpital d'évacuation*," those who can continue the journey will be re-entrained after dressing, if possible on the hospital train going to the L. of C. hospitals or base hospitals. The slight cases will be sent to the special centres for the slightly wounded, convalescent, etc.

During a rapid advance when the "*hôpital d'évacuation*" has become too far away, either the surgical centres mentioned above, or temporarily installed "*hôpitaux d'évacuation*" should be employed.

Two or three "*hôpitaux de campagne*," whose surgical personnel could be reinforced by the mobile surgical teams of the "*hôpital d'évacuation*," should be installed at a "*station d'évacuation*." When the new "*provisional hôpital d'évacuation*," thus organized, commences to function, the "*hôpital d'évacuation*" gradually ceases its work and, after having evacuated all the sick and wounded under treatment, should be moved forward. After its installation, which requires a certain time (on an average fifteen to thirty days), the provisional centre should be broken up and the "*hôpitaux de campagne*" of which it is composed employed for other work. At the moment of a general retreat, when the "*hôpital d'évacuation*" becomes threatened, the stream of wounded should be diverted elsewhere, to a hospital on the L. of C. or even a base hospital, which will then commence to function as a "*hôpital d'évacuation*." If necessary it could be reinforced by a few "*hôpitaux de campagne*" or a few mobile surgical teams.

A similar method of procedure could be adopted if it is not desired to move a "*hôpital d'évacuation*," when the latter has more cases than it can treat. One of the hospitals on the L. of C., or the base hospitals, or else a group of "*hôpitaux de campagne*" can receive the wounded coming directly from the front.

When the front is fairly quiet, and when the "*hôpital d'évacuation*" is

stable, wounded of all categories can be treated there, but a large proportion of empty beds must always be kept in readiness.

Since the "*hôpital d'évacuation*" receives not only wounded cases of every type, but also the sick and gassed, care must be taken to have in this hospital competent staffs for treating all categories of casualties.

#### IX.—EVACUATION TO THE HOSPITALS ON THE L. OF C.

In position warfare numerous special centres are formed in this zone. In a war of movement it appears that hospital accommodation on the L. of C. should be reduced, for it does not offer real guarantees of security. Enemy movements may produce much confusion. The evacuation of the hospitals in the zone of the L. of C. may become difficult or even impossible. The course of treatment would be checked in the case of a number of casualties. Hence in organizing hospital accommodation in this zone great care must be taken. The maximum size of a hospital for the zone of the L. of C. should not in our opinion exceed 300 to 500 beds.

#### X.—EVACUATION TO THE BASE.

The organization of hospital accommodation in the interior of a country offers nothing especial in relation to position warfare. Nevertheless we must bear in mind the fact that amongst the base hospitals, those which are in proximity to the zone of the L. of C. may be called upon to function as "*hôpitaux d'évacuation*" in case of a retreat from the fighting line. Therefore in designating for each army a zone of hospital accommodation in the interior of the country, it will be necessary to provide two groups of hospitals. One group will be in proximity to the front, the other in a region far removed from the front. The first group, which forms a sort of "safety valve" in case of retreat, should always keep a large proportion of empty beds (thirty to forty per cent). The hospitals of these groups will have a sufficient supply of medical equipment and personnel to be able, if necessary, to receive, classify and treat the wounded and sick brought direct from the battlefields.

#### XI.—EVACUATIONS IN CAVALRY FORMATIONS.

It may be useful to say a few words on evacuation in the cavalry higher formations, more especially since very little has been published on this subject in military medical literature. Our observations are based on the work of a Polish medical officer, Colonel Konczacki.

Cavalry in mass is employed either as an advance guard, or on the flanks of the army, or in raids pushed forward into the enemy lines. Therefore cavalry higher formations are frequently penetrated by small enemy detachments. Hence the medical units will be less well protected than when with infantry.

The "*hôpitaux de campagne*" could only be installed far from the



fighting line, in proximity to railway stations, that is to say, "stations d'évacuation." The wounded will suffer from this arrangement, but there is no other alternative. The "poste de secours divisionnaire" should be installed in proximity to the locality where the divisional reserves are situated, who, if necessary, will defend them. The medical company of the cavalry division would often have to be divided into two or three sections, each section being temporarily attached to a brigade. The cavalry medical units will be very light and mobile to permit of rapid movements.

In order to be able to lay down the organization of the medical service of a cavalry division, it is essential first of all to know what are the average casualties in cavalry. According to Konczacki, a division of 10,000 will have 300 casualties in one day's fighting. This figure represents heavy losses. The proportion of dead and missing will be greater here than with the infantry. Therefore it appears at first sight that the medical transport units should be smaller than those with the infantry. But in reality it is rather the contrary on account of the distances.

The convoys of wounded should generally be protected by cavalry detachments against enemy patrols. The motor ambulances should be accompanied by armoured cars.

During a cavalry raid the functioning of the Medical Service is very difficult. The objective of the troops who take part in a raid is to spread trouble and confusion in the lines of communication and administrative services in the enemy rear. What the Medical Service must bear in mind is: (1) The raid cannot last long; (2) the raid can only take place if the enemy is weaker from the physical or moral point of view.

In its first phase the raid endeavours to open up a passage by force. The wounded of this first phase would be evacuated more or less in the normal manner. After having penetrated to the enemy rear the cavalry seeks to destroy his stores, communication points, etc. It avoids major actions. Consequently the number of wounded will not be very great, but nevertheless the medical service will have difficulty in evacuating them. There is only one solution—that is to place the seriously wounded, who are unfit to be moved, in the civil hospitals under the protection of the Geneva Red Cross, and transport the others by the medical company, or other medical units, or even by requisitioned vehicles until the cavalry returns to its lines.

In these cases more than ever medical aeroplanes would be capable of rendering enormous services in transporting the seriously wounded. Sometimes, even before the end of the raid, the wounded could be evacuated, thanks to the escort provided by armoured cars, or by armoured trains, or under the protection of a strong patrol. In these circumstances the wounded are obviously very liable to fall into the hands of the enemy.

The casualties from a raid can only exceptionally benefit from an early surgical operation. They will often be treated by other and less modern methods. Our sole consolation will be to know that the Medical Service

has been able to save them from being taken prisoners, which is a terrible hardship in the case of wounded.

## XII.—LIAISON IN THE MEDICAL SERVICE.

We shall not dwell on liaison between the "poste de secours bataillon" and "poste de secours régiment" and the units, but we must remember that even a temporary interruption of liaison at this echelon is capable of producing very serious complications in the transport of the wounded, and considerable delay in their arrival at the hospitals. Liaison will be much aided by the "esprit de corps" which should exist between the medical officer and the officers and other ranks of the units to which they are attached. Medical officers imbued with this spirit will always have a tendency to follow their units, even in spite of the purely professional desire to remain behind with a view to giving more thorough care to the wounded.

The liaison between the "postes de secours" in the firing line and the Divisional Medical Service and the liaison between the higher echelons of the Medical Service will be established on the one hand by the means of transport belonging to the Medical Service, and on the other by means of the general organization of intercommunication drawn up and set working by the intercommunication service.

Whereas the former method of liaison has always been very much used, the latter seems to be less employed by the Medical Service. And yet what services could be rendered to the wounded, above all in a war of movement, if a good system of intercommunication were available.

Therefore we adhere to the following principles:—

(1) That the Directors of the Medical Service throughout the chain of command should collaborate with the heads of the intercommunication service.

(2) When installing medical units the systems of intercommunication should be taken into consideration.

(3) Care should be taken that all the units, and all the formations of the Medical Service, should be kept constantly informed of the general system of intercommunication (centre of intercommunication, telephone systems, visual signals, wireless, etc.), and arrangements should be made so that these medical units can take advantage of the above-mentioned means of intercommunication.

(4) The Directors of the Medical Service and commanders of medical formations and units should have their own means of intercommunication at their disposal—telephone, runners, mounted despatch riders, cyclists, motor cyclists, etc.

Liaison between the Directors of the Medical Service and headquarters, the importance of which has been much emphasized, should be still closer during a war of movement. Each modification of the aspect of the

struggle may have a direct repercussion on the distribution to be given to the medical units as well as on their movements.

### XIII.—NECESSITY OF MILITARY TRAINING FOR THE DIRECTORS AND THE COMMANDERS OF MEDICAL UNITS.

In conclusion, we will once more emphasize the absolute necessity for directors and those carrying out medical duties in the field to have a military training.

The directors as well as the commanders of medical formations and units are medical officers. Experience has clearly shown us that a unit, a medical formation, does not function well unless its commander is a military medical officer. Consequently, the medical officer, besides his medical training, should have a general knowledge of tactics, of medical tactics, he should be able to find his bearings on the ground, understand how to read a map, and should be a good administrator and instructor of his unit.

It is, therefore, most important to encourage medical officers, especially regular officers, to study the art of war. The organization of war games, making the medical officers carry out exercises of medical tactics on the map, or on the ground, will greatly facilitate their acquisition of military knowledge, the spirit of initiative and the habit of making prompt decisions, which, we repeat, is essential for medical officers in the field, especially during a war of movement.

### CONCLUSIONS.

(1) In a war of movement the medical formations should be placed fairly far from the firing line. Nevertheless this distance should be estimated so as to enable the wounded to arrive in a few hours at the hospitals, where, if necessary, they can undergo early surgical operation.

(2) Transport should be rapid, therefore the medical service should be allotted adequate means of transport for the wounded.

(3) It appears logical to give divisions a minimum allotment of means of transport, and to form strong reserves of these means of transport at the higher echelons—army corps and army. This reserve will serve to reinforce those of the division, which, on account of the great distances, or the great number of casualties, may temporarily need extra means of transport.

(4) During the advance only the minimum of medical units should be allotted to the higher formations. On the other hand, large reserves should be formed, by placing them to the rear, so as to be able to send them rapidly to any point of the fighting area.

(5) During the retreat medical units should be echeloned in depth. Preparations should be made if necessary to replace the medical units destroyed or captured by the enemy.

(6) Each Director of the Medical Service and each commander of a medical unit, although directing the transport of the wounded, should have

a limited rôle, well defined in space. This rôle should be in proportion to the means at his disposal.

(7) Small hospitals close up to the firing line will be organized for serious cases, whose condition requires urgent surgical treatment, and who can only bear a short journey. These hospitals ("hôpitaux de campagne") will have only small accommodation and will only be provided with a small surgical personnel. Nevertheless, this personnel can, if required, be reinforced by mobile surgical teams. Each division will be allotted a hospital of this type. Although in principle we are not in favour of splitting up our surgical forces by placing them in small hospitals, we are, nevertheless, obliged to admit that in many cases in a war of movement over an extensive area involving difficulties of transport, this splitting up is inevitable.

(8) The large hospitals, called "évacuation," situated more to the rear than the small hospital ("campagne"), only accommodate the sick and wounded incapable of standing a longer transport during heavy fighting. In the event of a rapid advance temporary "hôpitaux d'évacuation" can be quickly organized by grouping several "hôpitaux de campagne." Sometimes these groups may be called upon to function on the railway.

(9) When the zone of L. of C. is likely to be threatened by the enemy, the fixed hospitals in this area will not have a large hospital accommodation. In case of a retreat from the fighting line certain hospitals of the L. of C. may be called upon to replace the "hôpitaux d'évacuation."

(10) In the cavalry higher formations, especially during raids, the Medical Service in many cases will only be able to apply less modern methods of treating the wounded.

(11) It is important to emphasize the necessity of close liaison between the different medical units, as well as between the Directors of the Medical Service and medical units throughout the chain of command. For this purpose, not only stretcher bearers, drivers of medical vehicles, chauffeurs of motor ambulances will be employed, but also the transport arrangements included in the general intercommunication scheme drawn up by the intercommunication service.

(12) Training in military tactics is essential for all medical officers, directors, or chief medical officers of a medical unit in the field.

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## DISTINGUISHING COLOURED LABELS TO ASSIST HOSPITAL ADMINISTRATION IN THE FIELD.

BY BREVET-COLONEL JACK POWELL, D.S.O.  
*Royal Army Medical Corps.*

IN order to arrive at some easily recognized method of simplifying the transmission of instructions and information as to the movements of patients within field units, it is suggested that a colour scheme be utilized, each colour being allotted a definite significance, just as is done in the case of coloured lights on railways and in ships.

If this method be exploited by the use of a number of different colours a rapid scheme for dealing with sick and wounded can be evolved. Taking, for example, the scene at the C.C.S. when there is a "straff" on, sick and wounded of all sorts and kinds are coming in in a stream; overworked staff is attempting to read illegible cards, etc. Let us imagine some of this staff are dependent on glasses owing to defective vision, the light is bad, or a pencil becomes broken, etc., so that difficulties are at a maximum. Let us assume the Hospital or C.C.S. is prepared to receive casualties. Before the time fixed, each ward will bear a large coloured disc outside the doors.

Red	...	...	...	...	Surgical, ordinary.
Red and white	...	...	...	...	Surgical for operation.
Black	...	...	...	...	Medical, ordinary.
Black and white	...	...	...	...	Medical, acute.
Green	...	...	...	...	Prisoners.
Yellow	...	...	...	...	Gas, and so on, etc.

The receiving-room staff is supplied with tin discs painted in the colours to agree with the discs at the ward entrances. As the receiving officers note the case and decide upon its category, so the clerks place the correct coloured disc on the stretcher or give it to the patient. To the most ignorant of stretcher-bearers these colours will appeal, whereas, if left to themselves, they will wander through the hospital attempting to read what may be at the entrance to each ward, or making constant stops and inquiries. It is quite conceivable that lighting and weather may be very much against them, but a large coloured disc outside a ward which is the same as the disc they will have solves the question. The reception discs are returned to the reception room as opportunity occurs.

Now to exploit the colour scheme in the internal working of the hospital. As was found during the Great War, secret preparation had to be made and surgical teams would receive orders to proceed to a destination unknown until the last moment. These teams arrive at some C.C.S. where a very harassed O.C. receives them. The O.C. cannot be expected to memorize the names of the members of the teams. To him they are a unit which has to be worked, fed, and housed. He cannot be expected to

remember if it is Smith or Smythe, or any of the peculiarities of anyone's particular cognomen. To simplify matters it is suggested that when a team arrives the members of it are presented with a working chart and a distinctive colour (red, black, green, yellow, orange, etc., one for each team employed). The chart will show the hours for work, sleep, food and exercise. The colour will follow the team and its work throughout the hospital. To detail this scheme: First team to arrive is labelled "red." They have their operation table and full team of four; the operating-room clerk has got a supply of red "sticky-back" labels, about quarter of an inch diameter, which can be obtained at a cost of 9s. per 6,000. As the case leaves the operating room, the field envelope, which is attached to the patient, has a red label struck on to it by the clerk. The case goes to the appropriate ward. When the surgeon wishes to visit his cases, say the next morning, he need only go to the entrance of a ward and ask to see all "reds." While he was working, sleeping, or eating, the machinery of the Hospital has still gone on and all his "reds" may have been taken to "Blighty," or to the mortuary. Still, he can feel satisfied that he has tried to follow his cases, and he, being a new arrival at a strange C.C.S., need not spend hours feeling his way round and bothering busy people with inquiries as to where he may find his last night's operations.

I have been told that this colour scheme is impracticable, stupid, and cumbersome, but I have thoroughly tested it, and it requires the very smallest amount of intellect to make it work efficiently. The pivots of the whole thing are the operating-room clerks. Next in importance is the nurse or orderly of the ward. If he or she keeps a daily list showing the colours and the number of each in the ward, the answer to the visiting surgeon is accurate and immediate. It is noted that in a recent article in the *CORPS JOURNAL* this method is touched on as follows: "With the aid of coloured pencils and different coloured labels." I am attempting to exploit this remark. Coloured pencils are useless, for many obvious reasons, and it is submitted that "sticky-backs" will be found to be extremely efficient.

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## CENTRAL PROPHYLACTIC ROOMS.

BY BREVET COLONEL A. H. SAFFORD,

*Royal Army Medical Corps.**Late Consulting Dermatologist in India,*

AND

MAJOR R. C. PARIS,

*Royal Army Medical Corps.**Specialist in Dermatology, Baluchistan District.*

By a "Central Prophylactic Treatment Room" is meant a prophylactic treatment room situated in, or adjacent to, the brothel area and used by all units of the garrison, in contradistinction to a regimental prophylactic treatment room.

Such a room was instituted in Quetta, in April, 1923, but no record of attendances was kept until January, 1924, since when accurate figures are obtainable.

*Site.*—The brothel area in Quetta is situated mainly in one street in the city. A site was found at the end of a cul-de-sac adjoining the street, and only about thirty yards from the main road. Here a room was built by the Royal Engineers, and is kept in repair by them, no rent being charged. The room is distinctly marked, and its situation made known to all troops. As the city is over two miles from the nearest barracks, much time is saved in carrying out the treatment, the average time between exposure and treatment being only ten minutes.

*Equipment.*—Shelves are arranged along each side of the room and on them the necessary equipment is placed, and is arranged in accordance with the instructions issued with D.M.S. Circular No. 42, dated November 1, 1923. Hot water is supplied, and the room is lit by oil lamps, electric light not being available.

*Supervision.*—Two specially trained orderlies (regimental) are employed, one or other of whom is always on duty. It is important that these men be trained in the venereal wards of the hospital, and be able to recognize venereal diseases in various stages. One of the men actually lives in the bunk attached to the room. The room is open from 2 p.m. until half an hour after the city is "out of bounds," the road in which it is situated is "in bounds" during this period, a most important reservation enabling men who have remained in the city until the last moment to obtain treatment.

*Record of Attendances.*—A book is kept consisting of a ticket and a counterfoil.

Serial Number.

Date.

Time since exposure.

Remarks.

.....

Serial Number.

Date.

Regimental Number.

Orderly's initials.

The orderly writes the last four figures only of the man's regimental number on the ticket, to avoid it being used by another individual. This system works well, and the men realize that no personal record is kept.

Since the Great War the admissions for venereal diseases amongst British troops have been :—

Year		Syphilis	Gonorrhoea	Soft sore	Total	Annual ratio per 1,000 of strength	
						Quetta	All India
1920	..	56	233	134	423	135·9	118·2
1921	..	75	173	40	288	82·7	110·4
1922	..	47	136	83	266	85·7	84·7
1923*	..	26	75	53	154	59·4	71·3
1924	..	13	59	22	94	39·2	68·9
1925	..	17	59	13	89	35·7	72·1
1926	..	5	85	14	104	36·3	61·7

\* Room opened in April 1923.

The annual ratio per 1,000 of strength in 1896 was 504·5.

It will be seen from the above that there has been a very marked reduction in the incidence of disease since the room was opened.

Men who develop venereal disease and produce evidence of having used the room, are returned as "infections" in the records of the room.

In considering the infections it is always accepted as proof of failure of the treatment if the man can produce a ticket showing a date within a reasonable time. This evidence is frequently accepted, although one feels certain that a ticket has been obtained after actual infection has occurred.

The increase of infections in 1926 is disappointing, but was undoubtedly due to lack of proper supervision. The specialist in dermatology being absent on leave, several different officers did his work, and this led to a loss in continuity of control; also the attendants were changed more than once during the year. If there is an increase in the number of infections it is a sure sign that something is wrong at the room. This was proved to be so during the year—a surprise inspection of the room revealed many defects. On one occasion one of the central prophylactic treatment room orderlies was found with one of the military police in a brothel which had been placed "out of bounds." They evidently had great faith in the efficacy of the treatment.

It will be noticed that out of a total of 16,756 attendances, only one infection of syphilis occurred, but during the same period thirty-four men who had not used the room developed syphilis. Ever since the prophylactic treatment rooms were properly organized the incidence of syphilis amongst the troops throughout India has been remarkably low. It is also of interest to note that in 1925, when there was the highest number of attendances, the lowest incidence of disease was recorded.

The reduction in the number of attendances in 1926 was due to the Western Command manœuvres being held during the autumn, when the majority of troops were out in camp.



TABLE OF ATTENDANCES AND "INFECTIONS."

1924					1925				1926			
	Attendance	Infections			Attendance	Infections			Attendance	Infections		
		Syphilis	Soft chancre	Gonorrhoea		Syphilis	Soft chancre	Gonorrhoea		Syphilis	Soft chancre	Gonorrhoea
January ..	134	..	..	2	371	..	..	..	386	..	..	1
February ..	290	..	..	..	284	..	..	..	343	..	..	1
March .. ..	429	..	..	2	400	..	..	1	526	..	..	..
April .. ..	381	..	..	1	490	..	..	..	523	..	1	..
May .. ..	442	..	..	..	741	..	..	..	540	1	..	2
June .. ..	640	..	..	..	634	..	1	..	566	..	1	2
July .. ..	602	..	..	..	601	..	..	1	553	..	1	1
August .. ..	559	..	..	..	587	..	1	..	682	..	1	3
September ..	458	..	..	..	402	..	..	1	212*	..	..	4
October .. ..	123*	..	..	..	581	..	1	..	270*	..	..	..
November ..	625	..	..	..	388	..	..	..	367	..	..	1
December ..	526	..	..	1	567	..	..	2	533	..	..	1
Total ..	5,209	..	..	6	6,046	..	3	5	5,501	1	4	16
Total infections					6				21			

objects to any such record, but does not object to the ticket system. Even the changing of the orderlies has a deleterious effect.

(5) Cleanliness. Everything in the room must be kept clean, smart and attractive; much confidence is gained by this. The room should be well lighted, and its situation made known to all troops, especially drafts.

Although it is fully recognized that only a few stations in India are likely to be so fortunately situated as Quetta for the institution of such a room, it is felt that the results so far obtained are so remarkable as to warrant every endeavour being made in other stations to organize a room on similar lines. We know that such rooms are already in use in a few other stations, such as Karachi and Rangoon, but would urge a more extended adoption.<sup>1</sup>

A report written by Colonel H. S. Roch and Major R. C. Paris, in 1925 has been of assistance in compiling these notes.

The following figures have kindly been supplied by the Consulting Dermatologist in India, Lieutenant-Colonel T. H. Scott, D.S.O., M.C. :—

CENTRAL PROPHYLACTIC TREATMENT ROOM, KARACHI.

1926-				Attendances	Infections	
January	..	..	..	355	..	4
February	..	..	..	321	..	—
March	..	..	..	347	..	1
April	..	..	..	375	..	2
May	..	..	..	283	..	—
June	..	..	..	285	..	1
July..	..	..	..	248	..	—
August	..	..	..	323	..	2
September	..	..	..	243	..	4
October	..	..	..	223	..	—
November	..	..	..	223	..	—
December	..	..	..	202	..	—
Total			..	3,428		14

<sup>1</sup>The Consulting Dermatologist in India states that circulars were sent in December, 1925, to all commands in India and Burma on the subject of the formation of Central Prophylactic Treatment Rooms. The commands replied that the principle was excellent, but owing to the scattered sources of infection in the various stations the formation of such rooms was impracticable.

## Editorial.

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### THE VIRUSES OF VACCINIA AND VARIOLA.

IN spite of the many advances that have been made during the last few decades, there remain a number of common diseases which have baffled all attempts to determine the cause. Since no microbe for which a causal relationship can be proved can be seen in the pathological products, and as filtrates of suspensions of such products have in several instances proved capable of conveying the infection, the general impression has arisen that these diseases are caused by viruses which are, if particulate, of such small dimensions that they are ultra-microscopic and capable of passing through a filter which holds back ordinary bacteria.

The study of these viruses has been hampered by many difficulties, among which the most important seem to be the intermittent and irregular supply of material and the uncertainty of the methods of reproducing the disease by inoculation of animals. Dr. M. Gordon, working under the auspices of the Medical Research Council, has endeavoured to meet these difficulties and to apply logical and systematic methods to the study of this subject, and a report of his earlier investigations has been published.

He selected vaccinia as the first object of his study, for the following reasons: An unlimited supply of the virus is always available; rabbits are susceptible and show a characteristic and easily observed lesion on cutaneous inoculation; multiple inoculations can be done on one animal at the same time, and the development of specific antibodies to the virus in the blood of the inoculated animal can be demonstrated.

His first step was to evolve a method of quantitatively estimating the amount of virus present in any given suspension. This was done by making a series of dilutions of the suspension and inoculating them successively on the shaved skin of the back of a rabbit. In practice this was found to give very regular results, and as many as twenty-four inoculations could be made on one animal at the same time. Observations of the lesions produced indicated the dilution at which the suspension failed to produce any effect, and this afforded an index of the quantity of virus present in the original material. The rabbit also furnished a convenient culture medium for obtaining supplies of virus uncontaminated by the proteins of other animals for use in serological experiments.

The occurrence during the period of this investigation of several outbreaks of small-pox made it possible to compare the virus of this disease with that of vaccinia, and to make some observations on their mutual relationship.

The first trial of the method of estimating the amount of virus in suspensions was made with a number of samples of commercial calf lymph.

The results were very definite and showed very great differences in potency between lymphs obtained from different sources and also demonstrated the value of the method for research. The next observations were directed towards ascertaining the effects of various disinfectant substances on the virus. A suspension of the virus was treated with serial dilutions of each antiseptic and was subsequently inoculated cutaneously into a rabbit. By tabulating the results as positive or negative, a clear indication of the relative powers of inactivating the virus for each antiseptic was obtained. This showed that vaccinia virus behaves very differently from the ordinary pathogenic bacteria, and it is noteworthy that, of all the disinfectants tried, potassium permanganate appeared to be the most effective. It completely inactivated the virus in a dilution of 1:100,000, while mercuric chloride failed in 1:10,000, and carbolic acid in 1:20.

The method of multiple inoculations with serial dilutions of virus was also employed as a means of gauging the extent to which immunization had been produced by a preceding inoculation. In this case the animal to be tested was inoculated cutaneously with a series of dilutions of a known suspension of virus, while a control animal received similar inoculations. A comparison of the "end-point" in the one with that in the control rabbit gave a measure of the degree of immunization. Working on these lines it was possible to follow the course of the development of immunity in the rabbit after vaccination. The first signs of this immunity are found after four days, and it becomes substantial after ten days. After fifty days there is usually a fall, but some immunity persists up to a hundred days. Virus which has been heated for thirty minutes to 55° C. is still capable of producing immunity, whether inoculated subcutaneously, intracutaneously, intravenously or intratracheally, if given in sufficient doses. Heating to 65° C. materially reduces the prophylactic value, and heating to 100° C. or over practically destroys it. Phenolated virus was less effective in producing immunity than the virus heated to 55° C.

In making these observations, Dr. Gordon had in mind the establishment of a method of attenuating the virus which might be applied to the study of other diseases.

He next proceeded to investigate the development of complement-fixing and agglutinating substances in the blood of immunized rabbits. These were prepared by intravenous inoculation with repeated and increasing doses of virus. The complement-fixation test was carried out on standard lines, using a suspension of virus as antigen, and the agglutination tests were similar to those employed for bacteria, the suspension of bacteria being replaced by a suspension of vaccinia pulp or calf lymph, which had been centrifuged until all the larger particles had been thrown down.

With the sera of highly immunized rabbits complement-fixation was regularly obtained in dilutions of 1:200, exceptionally in 1:400. Positive results were also obtained in the agglutination tests; in these it was noted that the suspension prepared from rabbit vaccinia pulp was more sensitive than that from calf lymph.

These two tests were repeated, employing the same sera with antigens from other sources. Suspensions of crusts from the vesicles of cases of mild small-pox and confluent small-pox gave positive reactions, while suspensions of varicella scabs, material from a papulo-vesicular eruption unconnected with small-pox and some pus from a sterile fixation abscess, were uniformly negative. Hence it appeared that the complement-fixation and agglutination tests are specific for vaccinia and variola and, as each gave a quantitative result, they could be used as a means of determining the presence of virus in any given suspension and of estimating the amount present. In the detection of the virus of vaccinia they were not so sensitive as the cutaneous inoculation test.

Having reached this point, Dr. Gordon undertook some experiments designed to throw light on the physical properties of the virus. Tall, narrow tubes were filled with suspensions of vaccinia virus and allowed to stand for three days. At the end of this period samples were taken from the upper layers of the fluid and compared with a control suspension which had been shaken up. Quantitative tests showed a marked decrease in the amount of virus present in the upper layers of the fluid which had been exposed to the effects of the force of gravity. Corresponding experiments with centrifuged suspensions gave still more definite results. It was noticed that complement-fixing power was not reduced to the same extent as virulence when tested on the skin. Filtration through a pre-war Berkefeld filter removed the virus so completely that all three tests became negative. Later filtration experiments with newer filters, which were effective in holding back *Bacillus coli*, showed that a small proportion of the virus could pass through. These observations would appear to justify the conclusion that the virus is particulate.

The last series of experiments with vaccinia virus were tests of the permeability of different surfaces of the body in the undamaged condition. Suspensions of the virus were applied for a few minutes to the unscarified skin, external auditory meatus, conjunctiva, nose and mouth of rabbits. The animals were afterwards tested for immunity by means of the usual cutaneous inoculations. Those which had had the virus applied to the ear, eye and nose showed a complete immunity, indicating that these surfaces had been penetrated by the virus. Subsequent trials showed that of these three surfaces, the nasal mucosa was the most permeable. The animals which had the virus applied to the conjunctiva showed signs of slight inflammation, while those which had it instilled into the nose developed a nasal catarrh very similar to that seen in coryza in man. The watery discharge in the earlier stages contained large quantities of virus.

The study of the virus of vaccinia having been carried out to an extent sufficient to establish the methods of observation, attention was turned to the virus of variola. Two sources of virus were available, the mild cases of small-pox at Gloucester and a few confluent cases from Surrey. The actual material consisted of the dried scabs from vesicles collected by

nurses when making beds. Dr. Gordon prefers to use the term *alastrim* for the mild type of disease prevalent in Gloucester. As it still remains to be definitely proved whether this is identical with the well-known severe type of disease, parallel experiments were carried out with virus from both sources.

As the most useful way of detecting vaccinia virus had been found to be by inoculation of the scarified skin of susceptible animals, the first point to be determined was to what extent experimental animals could be utilized in this way for the detection of variola. It proved possible to produce lesions on the skin of the rhesus monkey with both *alastrim* and confluent small-pox virus. There was, however, a marked difference as regards virulence, the lesions caused by the latter being much the more severe. The inoculated monkeys were found to have developed some degree of immunity to vaccinia.

Complement-fixation and agglutination tests with antivaccinia serum, using suspensions of *alastrim* and variola crusts as antigens, gave positive results, but in this case no differences between the two antigens could be detected. Absorption of antivaccinia serum with suspensions of variolous material removed some of the agglutinins for vaccinia, but these experiments could not at the time be brought to a conclusive point owing to lack of material. Varicella crusts and pulp from staphylococcal lesions had no absorptive effect.

It was found impossible to infect the skin of rabbits or monkeys by cutaneous applications of varicella virus, and rabbits inoculated six times intravenously with this virus developed no immunity to vaccinia.

As the result of this research we seem to have conclusive evidence of the close relationship between vaccinia, *alastrim*, and variola, and also that varicella is essentially different from these three. Employment of the cutaneous scarification test, or the complement-fixation or agglutination tests, should thus serve to establish the diagnosis between variola and varicella in doubtful cases. Apart from this direct application of its results, the investigation raises many points which may lead to the discovery of important factors in the spread and control of diseases due to this class of virus. Outstanding among these is the susceptibility of the nasal mucosa of the rabbit to vaccinia, and the associated development of catarrh with excretion of the virus in the discharge from the nose. This suggests an analogy between vaccinia, influenza and the common cold, and raises the question of the mode of transmission under natural conditions of vaccinia from one animal to another, and possibly also that the route of infection of man in the case of other diseases, such as small-pox, may be through the nasal mucous membrane.

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## Clinical and other Notes.

### A CASE OF SUBACUTE ENDOCARDITIS WITH AORTIC VALVE AND PULMONARY ARTERY INVOLVEMENT.

By MAJOR H. B. F. DIXON, M.C.

*Royal Army Medical Corps.*

AND

MAJOR W. R. O'FARRELL.

*Royal Army Medical Corps.*

MEDICAL literature, particularly since the war, is rich in observations dealing with subacute and chronic endocarditis. In view of these, the recording of a single case would hardly seem justified. Nevertheless, we have been induced to describe this case for a number of reasons.

Firstly, on account of the definite increase of subacute endocarditis since the war. Secondly, because the true nature and medical diagnosis in this case was for a time obscured by an outstanding renal involvement. Lastly, because of the almost, if not quite, unique post-mortem findings of massive vegetations in the pulmonary artery.

Furthermore, we believe the case is important from the point of view of the correlation of signs and symptoms with clinical methods and pathological findings and their combined application to diagnosis, prognosis, and possible lines of treatment.

Serjeant "X," aged 35, was admitted to hospital November 19, 1926, complaining of "pain in the back." Four days prior to admission he noticed that his feet and ankles were swollen to such an extent that he could not get his boots on.

On questioning him he stated that he had never suffered from headache or any swelling of his face or eyelids. He admitted that for some time past he had been short of breath. He had been passing urine more frequently of late, but he thought the quantity passed at any one time was less than usual.

There was no history of "family" cardiac or renal disease.

His previous illnesses had been: heat stroke in India in 1921, tonsillitis in 1922 and malaria in 1924. On his return from India in 1925 he had a mild uncomplicated attack of influenza. In 1926 he had a recurrence of malaria, parasites were found and he recovered under quinine treatment.

On examination: The patient's left leg was found to be œdematous and pitted on pressure, there was no œdema of the right leg. The heart was hypertrophied, its action forcible and the aortic sound was accentuated—no bruits were detected. The blood-pressure registered, systolic 120, diastolic 85 millimetres of mercury. The ocular fundi were normal. There were no signs of dental sepsis. The urine contained albumin and a

few red blood-corpuscles but no casts were seen. Temperature 100° F., pulse 76 per minute.

Examination of the blood failed to show malarial parasites. On the night of the 20th the patient vomited three times. The total quantity of urine passed during the preceding twenty-four hours was twenty ounces. The blood-urea was 106 milligrammes per 100 cubic centimetres. Temperature normal.

November 21: The patient was ordered hot-air baths and placed on a diet for a case of acute nephritis. Albumin and casts were present in the urine. The evening temperature was 99·6° F.

November 23: Some ascites was present, nevertheless the total twenty-hour quantity of urine passed was sixty ounces. The percentage of albumin was 0·075 and the urea one per cent. The morning temperature was normal but the evening temperature rose to 100·5° F.—the pulse was 88.

November 24: Morning temperature was normal, the twenty-four hour specimen of urine, twenty-six ounces, contained 4·9 grammes of sodium chloride. The diastatic power of the urine was ten amylolytic units. Wassermann reaction was reported negative.

November 26: Although the albumin percentage fell to 0·05, slight fever continued.

December 1: Œdema of the left leg persisted, the right leg was also œdematous, but, to a lesser degree, ascites was present. The blood-urea was 120 milligrammes per 100 cubic centimetres.

December 4: The patient appeared to be better, the twenty-four hour specimen of urine was fifty ounces. The albumin percentage 0·075.

December 8: He did not appear so well. The temperature though not above 100° F. was not accounted for. The twenty-four hour specimen of urine was forty ounces, the albumin 0·17 per cent. The blood-urea was 99 milligrammes per 100 cubic centimetres. A systolic and diastolic bruit was heard over the mitral area. The patient's condition gave rise to anxiety. A consultation was held with Major Todd, R.A.M.C., who considered the condition was one of infective endocarditis. He was placed on the "seriously ill" list.

A total blood-count was made: Hæmoglobin 50 per cent. Red blood-corpuscles 2,800,000. Colour index 0·8. Total leucocyte count 2,500 white cells per cubic millimetre.

Differential leucocyte count: Polymorphonuclear leucocytes, 58 per cent; small lymphocytes, 13 per cent; large lymphocytes, 25 per cent; transitional cells, 3 per cent; mast cells, 1 per cent. A blood-culture was taken.

December 10: Although the temperature had fallen to normal, a few petechial spots were found on the shoulders and around the clavicles. An aortic diastolic bruit was noted. The systolic blood-pressure was 110, diastolic 70. The urine was cultured. The patient was placed on the "dangerously ill" list.



December 15: The blood-culture showed the presence of a long-chained streptococcus. The urine also showed a streptococcus on culture.

December 17: The patient was given five cubic centimetres of a one per cent solution of mercurochrome intravenously. This produced a very severe reaction with intestinal symptoms (vomiting, diarrhoea, with passage of blood and mucus).

December 20: Although the twenty-four hour specimen of urine was fifty ounces, the ascites had increased and there was œdema of the lumbar pad. The patient was ordered a mixture of digitalis and strychnine and was placed on an Epstein diet.

December 30: A vaccine, prepared from the streptococcus isolated from the blood, was given in an initial dose of 4,000,000 cocci. The streptococcus was non-hæmolytic and according to Holman's classification *Streptococcus salivarius*. The patient's general condition did not improve, the anæmia was more marked. The apex beat was outside the nipple line, the blood-pressure was poor. The liver was enlarged and tenderness was present over the splenic area. The œdema was increasing.

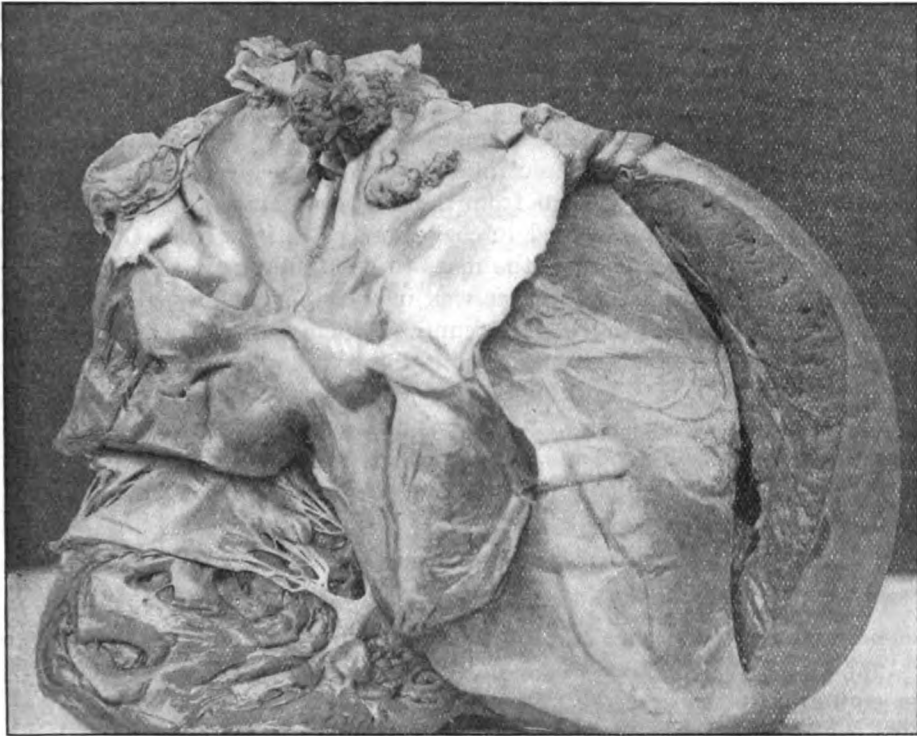
January 1, 1927: The vaccine produced no reaction. The œdema of the legs had increased. Murmurs were present over the whole of the cardiac area, aortic diastolic and mitral systolic and diastolic. In spite of the Epstein diet the œdema persisted, the albumin percentage remained high.

January 4: The patient was rapidly going down hill, the œdema and ascites were increasing, there was some œdema of the base of the lungs. Albumin 0.4 per cent, pulse was failing.

January 9: Although digitalis had been given four-hourly, the pulse was irregular and feeble and anginal pain complained of. Speech became weak. Death occurred.

*Post-mortem Examination*, January 10, 1927. — General: Body emaciated, post-mortem rigidity not well marked. Post-mortem staining was present on the back. There was a dusky patch of commencing putrefaction around the umbilicus. On palpating the abdomen ascites was noted to be present. The legs and scrotum (to a lesser extent) showed œdema which pitted on pressure. Abdomen: Considerable quantity of serous fluid was present. Spleen enlarged; weight  $43\frac{1}{2}$  ounces. The upper pole was occupied by a large infarct showing both old and recent characteristics. Numerous other smaller infarcts of some age were also present. The splenic pulp was moderately firm. Liver was enlarged, weight ninety-three ounces, nutmeg type. Kidneys were enlarged, weights: Left kidney  $12\frac{1}{2}$  ounces, right twelve ounces. The capsule stripped readily, the external surface was smooth but showed numerous red points against a white background "flea bitten." On section the cortex was found to be enlarged and, though mottled, was in marked contrast to the deeply congested pyramids. It is of interest to note that there were no infarcts in either kidney. Suprarenals: There was granular condensation of the yellow pig-

ment of the cortex. Pancreas: No pathological change. Thorax: There were firm adhesions of the thoracic and diaphragmatic pleura over the lower lobe of the left lung. These had to be forcibly broken down, causing injury to the lung tissue. Left lung: Shrunken; weight twenty-three ounces; there was a central infarct in the lower lobe. Right lung: weight thirty-six ounces; there was a recent infarct about the size of a Tangerine orange in the right lower lobe. The infarct was raised above the lung



The right ventricle and pulmonary artery have been laid open. Above the pulmonary valve on the arterial wall three warty masses are seen, and above these the ulcerated surface of the largest mass is displayed.

surface. Heart: On opening the pericardium about six ounces of straw-coloured fluid was found to be present. The heart was greatly enlarged and the anterior surface showed four or five milk spots. The weight of the heart was thirty-one ounces. Right auricle was atrophied and dilated, the cavity contained "chicken fat" agonal clot. The tricuspid orifice admitted the tips of four fingers. A patent foramen ovale was present. Orifice diameter two millimetres. Right ventricle: The most striking change in the ventricle was the bulging into the ventricular cavity of the interventricular septum. This was so marked that the carrying capacity of the ventricle must have been seriously diminished.

**Pulmonary artery:** About two inches above the pulmonary cusps on the posterior wall of the vessel four wart-like vegetations were present, the smaller ones were moderately firm, but the largest, which was the size of a small walnut, was friable (see fig.). **Left auricle:** Dilated. The mitral valve admitted two finger tips. The mitral curtains were opaque but showed no active disease. **Left ventricle:** The walls were hypertrophied and firm. The cavity was roomy, mainly owing to the deflection of the hypertrophied interventricular septum into the cavity of the right ventricle. The aortic orifice was almost completely occluded and occupied by a mass of vegetations springing from the aortic valve cusps. The vegetations were principally on the posterior and right lateral cusp. The left lateral cusp showed but slight signs of acute disease, but a calcification of the margin indicated that there had once been some old lesion. Cultures of the heart's blood and from the larger splenic infarct showed the presence of streptococci in pure culture. Sections from the aortic vegetations showed large masses of streptococci embedded in coagulum. Sections from the lesions of the pulmonary artery showed the mass to be of fibrous nature springing from the arterial wall. The surface was in part covered by endothelium, continuous with the arterial endothelium. This investment was in places broken and covered by coagulum containing many polymorphonuclear leucocytes; in one region a mass of streptococci was present. The pulmonary artery lesions were, therefore, not true vegetations but pedunculated fibrous polypi of some age. The surface of one of these had become involved in the general blood-infection and vegetations had formed on the ulcerated surface.

#### CONCLUSIONS.

We consider that the unusual vegetative lesions on the polypoid mass in the pulmonary artery were due to the displacement of the interventricular septum, occasioned by the disease of the aortic valve. The projection of the septum into the right ventricular cavity must have considerably slowed down the blood-current in the pulmonary artery, and probably deflected the blood-jet from the true line of the pulmonary artery so as to impinge on the diseased area about two inches above the pulmonary cusps.

The foramen ovale opening was too small to have had much influence on the formation of the lesion.

The branches of the pulmonary artery were traced into the lungs, but no further vegetations were discovered.

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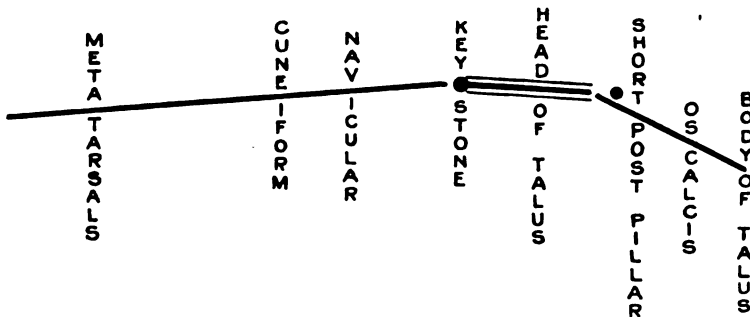
## PES PLANUS.

BY TEMPORARY CAPTAIN J. H. ROBINSON.

*Royal Army Medical Corps.**Honorary Surgeon to the Royal Maternity Charity, London.*

THE diagram illustrates the longitudinal bony arch of the foot.

The critical point in the arch is the keystone, and this is supported by the plantar calcaneonavicular (or spring) ligament, which is very strong, partly fibro-cartilaginous, and containing much elastic tissue. This ligament extends from the sustentaculum tali to the tuberosity and inferior surface of the navicular bone. It supports above the head of the talus, and is an important factor in maintaining the antero-posterior arch of the foot, in consequence of the support from below which it receives from the tendon of the tibialis posticus, this tendon dividing into a number of fasciculi to be attached to most of the tarsal and metatarsal bones. In addition, the tendons of the flexor longus digitorum and the flexor longus hallucis give additional support to the arch.



The first layer of muscles in the foot also helps considerably as its components normally exhibit marked tonicity when they help to support the arch of the foot, and become relaxed when the individual assumes a sitting position. They are the adductor hallucis, the flexor brevis digitorum and the adductor minimi digiti. The names of the muscles indicate their actions, and they extend from the os calcis to the toes.

Muscle tone obviously plays a very big part in the maintenance of the arch of the foot, and this is dependent upon exercise and normal metabolism. There cannot be the latter without the former.

Many remote conditions affect adversely the arch of the foot. There are diseases such as polio-encephalitis, poliomyelitis, tabes dorsalis, and so on, which will not be considered here as they are outside the province of this article.

The adolescent is prone to flat-feet, and so is the expectant mother. In both these states there are physiological readjustments of metabolism, in addition to the mechanical factor due to increase in body-weight.

Rickets has justly been considered a potent factor in causing loss of the arch of the foot, and this condition has probably frequently a pre-natal origin, the expectant mother being the subject of some degree of inadequate fat metabolism, and showing clinically acetonæmia and diminished nitrogen excretion. During childhood the accepted factors operative are lack of oxygen in sufficient quantities, and of the sun's rays, fat, proteids, and lime salts.

A congenital form of flat-feet has been repeatedly stated to be due to a faulty position of the foetus *in utero*. X-ray examination is the only reliable method to diagnose flat-foot in the newborn, the infant's foot being so thickly covered with soft tissues, and as Holl pointed out congenital flat-foot is often due to cartilaginous union between the os calcis and scaphoid. The so-called racial variety of flat-foot met with in negroes and Jews probably finds its origin in lack of exercise and can hardly be considered an anatomical peculiarity. It is much more evident in the males than the females, and there is always an associated wasting of the muscles of the leg.

This is caused by physiological atrophy of physical indolence, the lazier the Native the flatter the feet.

Stronmeyer pointed out that the feet of individuals subject to flat-foot are colder than normal, and varicose veins often accompany the condition. The asthenia of indolence is associated with cold and flat-feet. Consequently joint mobility is less than normal and ankylosis has been recorded. Many town dwellers of sedentary habits have acquired slightly flat-feet, they walk without elasticity, and turn the toes outwards. There is always an increase in the width of the foot due to the collapse of the transverse arch. Pain on the dorsum of the foot and diffused around the external malleolus is constant if the condition is progressive, but a stage is soon reached at which pain ceases, and does not return until late in life, when marked increase in body-weight may recreate subjective discomfort, and elicit often from our patients a self-diagnosed disease they call rheumatism, due to the objective evidence created by the internal displacement of the talus and scaphoid. The majority of individuals exhibiting this disability are actually the subjects of what is accurately described as PARTIAL flat-feet, and with the disappearance of pain, when prolonged exercise again becomes possible, muscle tone is re-established, muscle nutrition improves, and the utility of the foot becomes again evident.

In the treatment of this condition exercise and massage are all-important factors, directed to restore tone to the wasted muscle. The patient should endeavour to walk with the toes pointed inwards, and if an adolescent he should sit, when circumstances permit, in the cross-legged tailor fashion, and while in this position constantly move the toes.

If hallus rigidus is superimposed a bar of leather placed transversely across the sole of the boot a little posterior to the metatarso-phalangeal articulations gives immediate relief from pain. As often pointed out, it is necessary for these patients to wear specially made boots.

Practise for a short time at repeated intervals daily walking on the outer border of the foot, and, conditionally that hallus rigidus is not an associated condition, perform the tip-toe exercises of Ellis. It is suggested that in flat-feet we are dealing with a surgical disability where rest as a line of treatment is irrational, as rest involves muscular wasting and a concomitant partial arrest of muscle metabolism. But the complete solution of the problem is doubtless more comprehensive.

An examination of the urine for albumose, which is evident when protein materials are undergoing autolysis, and for any other evidence of disturbed metabolism, is desirable. Ascertain "nitrogenous equilibrium" by estimating the total nitrogen output. Certainly some measure of treatment should be directed to the questions of general nutrition and the elimination of waste products. Flat-foot is occasionally only a local manifestation of a disturbance of metabolism and these are cases which come within the province of the biochemist. Lack of proteins has been often empirically stated to be an important factor in the ætiology of rickets, and flat-feet are very intimately associated with rickets.

But to return to the causative hypothesis, there cannot be normal metabolism without exercise, and without exercise, or plastic operation, flat-foot, *per se*, is incurable.

The softening of the ligaments which occurs physiologically in the later months of pregnancy is probably due to what might be called, for want of a better term, physiological toxæmia. Many pregnant women as they approach term, fail to some extent in their nitrogen excretion, and incidentally their ligaments commence to soften.

The severity of a case of diffuse myelomatosis is related to the amount of albumosuria (Bence-Jones' proteid).

Flat-feet following childbirth will without treatment persist, and can only be successfully dealt with on the same lines as flat-feet from any other cause. Exercise and massage to re-establish muscle tone, attention to general dietetic problems, and measures to ensure the elimination of waste products are important.



## Echoes of the Past.

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### DIARY OF A FIELD HOSPITAL DURING THE SOUTH AFRICAN WAR.

BY LIEUT.-COLONEL G. H. YOUNGE, F.R.C.S.I.  
*Royal Army Medical Corps (Ret.).*

DURING 1899, whilst stationed at Fort Pitt, Chatham, it was my good fortune to be sent to Bulford Camp, Salisbury Plain, as second in command of No. 15 Field Hospital, for a month's field training. I use the phrase "good fortune" advisably, as up to that time only two or three of the hospital staff had any previous experience of work in the field. On reaching Bulford we had the further good fortune to find the late Colonel G. A. Hughes, D.S.O., acting as P.M.O. of the camp, for he had an exceptionally large experience of active service conditions, and made our course of training as practical and useful as possible. I may say that, on reaching Natal, we found that month's training of immense service to us.

Whilst at Bulford an intimation was received from the War Office that, in the event of war in South Africa, No. 15 Field Hospital would be detailed for duty with the Irish Brigade.

On October 9, 1899, I received orders to mobilize the hospital. A busy time followed. Requisitions had to be submitted to Pimlico for men's clothing and requisites. The hospital equipment had to be inspected at the gun wharf, and then packed in suitable cases. When this was done the contents of each case was distinctly painted in white on the outside—a procedure which was subsequently found of the greatest convenience, as it saved much time and trouble in finding articles which were needed in a hurry. As the reservists joined they had to be medically examined, and those found fit had to be clothed and their papers examined and completed to date. Arrangements had also to be made for the payment of allowances to the wives of those who were married, and many other matters attended to.

On November 4, 1899, the mobilization of the hospital was reported as complete to the War Office, and two days later Major-General T. Fraser, C.B., C.M.G., commanding the Thames District, inspected the hospital and complimented the unit on its appearance and smartness.

We left Chatham by special train at 8 p.m. on November 7, the following officers doing duty with the unit: Major G. H. Younge (in command), Major F. T. Wilkinson, Captain (now Major-General) E. M. Pilcher, Lieutenant (now Major-General) R. S. Hannay, and Lieutenant and Quartermaster (now Major) J. Hirst. Our train travelled straight through to Liverpool, which we reached in the grey of a cold, bleak, dismal morning. After a light breakfast in the station we went straight on board the S.S. "Bavarian," which sailed at noon on November 8 for

Queenstown to embark two battalions of our brigade. About 2 p.m. on November 10 the 1st Battalion Connaught Rangers, the 2nd Battalion Royal Dublin Fusiliers, and No. 8 Bearer Company, came on board, and we left Queenstown at 4.30 p.m. the same evening, having a truly magnificent send-off. The town is built in large part up the slope of a fairly steep hill. As we weighed anchor every house in it was brilliantly lit up with red and green lights in honour of the Irish regiments, and these zig-zagging up the hill made a most effective picture. The piers, docks and streets of the town were packed with dense crowds who had come down from Cork and from many of the towns in Southern Ireland to see two Irish regiments start for the war. As the transport left her moorings the crowd seemed one mass of waving flags and handkerchiefs, whilst cheer after cheer burst from them. Two bands, one on board the Admiral's flagship, the other on the pier, played "Auld Lang Syne," and were answered by the two bands on board the "Bavarian." For a time so great was the volume of sound that the very ship seemed to rock under our feet from the vibration.

I daresay many of my readers have seen Cork Harbour. It is really a magnificent one, probably one of the finest and safest in the world. Ships enter it through a deep, narrow channel, on one side of which towers Fort Camden, and on the other Fort Carlisle. Immediately these are passed the harbour spreads out on either side, so that it measures some eight miles from east to west by four from north to south. As the surrounding country is hilly and beautifully wooded, the view from the harbour is superb—not to be surpassed in any part of the world, I believe.

The voyage from Queenstown to the Cape is a most uninteresting one. There is little but sky and sea to look at. We, however, had one or two breaks in the monotony. At 5 p.m. on November 13 we passed the S.S. "Cheshire," also bound for the Cape, with the Gordon Highlanders on board. The "Cheshire" was a very slow ship, the "Bavarian" a very fast one, so that we raced by them. We passed so close that one might almost have thrown a biscuit on board the "Cheshire." As the two ships passed the troops manned the decks and rigging. The men cheered lustily and the bands played Scotch and Irish melodies.

We reached Las Palmas after nightfall on November 14. The captain had intended to coal there, and we had been looking forward to stretching our legs on shore. We had hardly got inside the harbour, however, when the British Admiral signalled that a suspicious-looking vessel had been seen cruising about in the offing for some days. She was supposed to be a hostile gunboat with sinister designs on outward-bound transports. We were, therefore, ordered to sail at once in a westerly direction so as to escape attack. We did so, going considerably out of our course. We neither saw nor heard anything more of the suspicious craft, and the general impression seemed to be that the rumour was a myth. On November 25 we passed the "Dunotter Castle," the liner which had taken



Sir Redvers Buller out to the Cape, homeward bound. As she passed she signalled: "Big battle; British victory." It was Lord Methuen's battle on the Modder River.

Our original orders had been to disembark at Capetown, but when we reached there on November 28 we were ordered round to Durban at once, as General Buller's original plan of campaign had been altered to meet later developments. We were, therefore, only able to see Capetown from the sea, but it made a lovely picture. In the background were three steep hills—Table Mountain in the centre, Lion Hill on the right and a circular hill, whose name I forget, on the left. From the foot of the hills the ground sloped gradually down to the sea. The sloping ground was thickly covered with handsome buildings, and as all, or nearly all of these were cream or white in colour they showed up beautifully against the lovely tropical vegetation which grew luxuriantly around each house.

We reached Durban at 6 a.m. on December 1, 1899, and disembarked at once, railing up to Pietermaritzburg through magnificent scenery. The train passed from hill to hill and ridge to ridge, each higher than the last. Between these were long fertile valleys covered with rich fruit trees and semitropical vegetation, amongst which pineapples predominated.

Some of the railway stations were almost smothered in arum lilies, the perfume from which was heavy enough to be almost suffocating. We halted at Pietermaritzburg for five days to draw transport and officers' chargers. Each field hospital was allowed a water cart and four ox wagons. The wagons had heavy, circular, canvas hoods and were fearful and wonderful structures. They had huge, rectangular bodies, which ran on four massive wheels. Each wagon weighed some two tons, was drawn by sixteen oxen and was capable of carrying a load of at least five tons. On reaching Pietermaritzburg we found that an order had just been published permitting mounted officers to hire chargers from Government at a nominal charge of 6d. per day instead of purchasing them, as we had anticipated. This was naturally an immense convenience; indeed, a very great boon to mounted officers. The range of selection also was much larger than we had anticipated, so that we were able to congratulate ourselves all round on our good fortune.

Pietermaritzburg is fifty-four miles north of Durban and is 2,218 feet above the sea level, a fact which illustrates the steep ascent made by the railway. The town is prettily situated on a large plain which, to the south and south-east, is fringed with steep and beautifully-wooded hills. It contains many handsome buildings the most important of which are Government House, the Legislative Buildings, the Colonial Offices and the Town Hall.

On December 8, 1899, we reached Frere by rail and joined the force under Sir Redvers Buller, V.C., and the following day the hospital opened for the treatment of sick. On December 13 four infantry brigades marched from Frere to Hill Grove—a low ridge which ran parallel to the River

Tugela and faced the Boer position at Colenso. From the summit of Hill Grove their position lay spread out before us like a vast panorama, and looking at it one could scarcely suppress a shudder at the thought of what it would cost to dislodge an enemy from such a fastness. No words, indeed, could give an adequate impression of its overwhelming strength. Opposite Hill Grove the Tugela River was deep and swift and fully 200 yards wide. Its north bank sloped upwards at a steep angle and was fringed with low, closely packed and yet isolated kopjes of every conceivable shape. Passing northwards, in the direction of Ladysmith, these rose higher and higher until, about a mile beyond the river one peak, known as Groblar's Kloof, rose to a height of 4,000 feet. Beyond Groblar's Kloof there was a deep dip, and then a second series of hills rose and ran in a north-easterly direction. Away to our left the same broken series of hills ran parallel to the river until, some twenty miles to the left, they ended in two stupendous bastions, known as Spion Kop and Taba Myama. The whole series included every conceivable shape and size, packed together in the most fantastic manner. The surfaces of the hills were constantly broken by deep notches, by irregular depressions, by huge masses of rock, by vast ruts caused by heavy downpours of rain, whilst in many places they were thickly covered with mimosa scrub. The whole position was, indeed, so formidable that after a prolonged study of it one of the foreign military attachés was rumoured to have said, "Well, if General Buller relieves Ladysmith it will be the eighth wonder of the world."

On our side the ground sloped steadily downwards from Hill Grove to the river—a distance of nearly three miles. Imagine a billiard table, one side of which has been raised twelve inches, and it will give you some idea of what the position was like. The ground was practically level and, except for a few ant hills and some stunted mimosa bushes, was destitute of cover either against the scorching sun or the devastating fire of the enemy.

Near the centre of Hill Grove there was a slight conical eminence, some fifteen feet higher than the rest of the ridge. As soon as they reached it the naval guns were mounted on this and at once opened fire on the Boer position. The fire was continued throughout December 14 with steadily increasing vigour. During that time, however, there was not the faintest sign from the enemy; not a shot was fired, not a man seen. Indeed, the complete absence of any sign led some at least of our officers to conclude that the position had been evacuated.

At 7 p.m. on December 14 the Commanding Officers and Seconds-in-Command of Units met at the G.O.C.'s office, and General A. Fitzroy Hart minutely described the details of the attack which was to be made on the Boer position next morning. The Irish Brigade were to make a dash for Bridle Drift, situated some three miles above Colenso Bridge. Having seized this they were to cross the river and endeavour to turn the Boer right flank. I was instructed to remain at Naval Hill, with oxen inspanned and equipment loaded, until I heard that the Brigade were across the river.

I was then to push on as quickly as possible, to cross the drift and to pitch the hospital on the north bank of the river alongside the drift. We were up at 2 a.m. on December 15 and moved to our allotted position at Naval Hill long before daybreak. At the first streak of dawn I climbed the hill and stood listening for the first shot. It was fired by one of the naval guns at 5.35 a.m. In a moment a perfect hurricane of artillery, and musketry fire broke forth and raged for some six hours without a lull. I was standing close to the famous war correspondent, the late Bennett Burleigh, who had probably witnessed more battles than any man then living. In his opinion the musketry fire at Colenso absolutely dwarfed anything he had ever heard before. Fort Wylie was believed to be the centre of the Boer position and our artillery concentrated their fire upon it. Repeatedly throughout the day the hill appeared to be a sheet of flame from the bursting of shells upon it.

I waited hour after hour for an intimation that the Irish Brigade had crossed the river. About 11 a.m. I saw a long line of ambulances approaching Naval Hill. I hurried down and started every man unloading equipment and pitching tents. By 3 p.m. we had 314 gunshot wounds in the hospital. As we worked steadily on amongst them our chief complaint was the terrific heat. The sun blazed on our heads like a furnace, the air was so still that even a feather would have fallen to the ground perpendicularly, and each breath seemed to scorch our lungs. At 7 p.m. we had half an hour for dinner. At midnight, after twenty-two hours strenuous work, we could hold out no longer and collapsed in sleep on the floor of the operating tent. We were again at work at 6 a.m. on December 16 and kept steadily on until 6 p.m., when a mounted orderly galloped up with a note from the P.M.O. which said, "Evacuate your hospital as quickly as possible and rejoin your Brigade." Fortunately the hospital was pitched within a few yards of a railway line. Within a few minutes Major (now Colonel) G. W. Brazier-Creagh's ambulance train steamed up alongside it and stretcher-bearers seemed to spring simultaneously from every point of the compass. By 9 p.m. we had despatched every patient to the base hospital, had struck and packed our tents and had loaded them and the equipment on the wagons. We had then to find our Brigade, which was three miles away. It took us three hours to do so, for in that short distance we encountered more rocks, more spruits, more dongas than I would have believed existed in the whole of South Africa.

On reaching the Brigade we learned that it was to march for Frere in an hour. No sooner had we halted than the men, completely worn out, sank on the ground and were asleep in a second. I would have given worlds to follow suit, but I felt convinced that if I did so there was not a chance of our waking up to march with the Brigade, a lapse which would have meant a disagreeable anti-climax! I therefore spent the time walking rapidly up and down in front of the men, smoking furiously to keep myself awake. To do so for an hour, however, was perhaps the most

difficult task I have ever accomplished. There was a brilliant full moon and we congratulated ourselves. The fates were unpropitious, however, for hardly had we started when a total eclipse set in. On we stumbled in total darkness over the most awful ground, now dashing our toes against huge boulders, now struggling through the most agonizing thorn-bushes. Many times during the night I fell fast asleep on my horse, and only saved myself as by a miracle from pitching on to my head. At 6 a.m. on December 17 we reached our old camping ground at Frere. No sooner had we halted than I literally fell from my horse in a dead sleep. No matter the blazing sun! It would have taken a dozen "Long Toms" to wake me! That evening classified returns of the gunshot wounds treated at Colenso were submitted to the P.M.O., Natal Army, Colonel (now Major-General) Sir T. J. Gallwey, K.C.M.G. As a full report of the cases appeared in vol. iii of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, I shall not again enlarge on them, but the following summary is interesting: Head, 25; face and neck, 14; chest, 19; abdomen, 23; back and spine, 21; upper extremity, 83; lower extremity, 129; total, 314.

Did space permit, many incidents which happened in Frere Camp might be related. I will mention only two, however. On Christmas Day every officer and man of the force received a one-pound plum pudding, sent out by Messrs. Lyons & Co., of London. We ate them with gusto and drank health, wealth and prosperity to the generous donors. About 6 p.m. on December 29 a tempest of rain set in and lasted for fifteen hours. As our camp was in a valley surrounded on three sides by low hills, a rushing torrent six inches deep ran through the tents all night long. The men had to stand in circles with their backs to the tent poles, as of course they could not lie down. The same thing happened on January 8 and 9, 1900. On January 8, 1900, under instructions from the P.M.O., Natal Army, the hospital was evacuated, all cases being transferred to No. 4. Stationary Hospital, and a large reserve of medical comforts was drawn from the Army Service Corps.

At 3.30 a.m. on January 10, 1900, the Irish Brigade struck camp and marched to Pretorius' Farm, a distance of eight miles. After torrents of rain on the 8th and 9th the road, which was little more than a track across country, was in an awful condition, literally knee deep in mud. The wagons sank to the axles or even further, and a number of them became absolutely jammed. During the march at least two raging spruets had to be forded, which did not improve matters.

At 5.30 p.m. on January 16 the force under Sir Redvers Buller, V.C., rendezvoused at Spearman's Hill, and did a forced night march to Emmadale, a huge, level plateau, which overlooked the Tugela at Potgieter's Drift. We reached our position shortly after 2 a.m. on January 17, and the men were ordered to lie down and get what sleep they could. Worn out by a long and harassing march they threw themselves on the ground and were in a dead sleep in a moment. A few minutes later an incident occurred

which shows how easily a panic might arise during the night, even amongst the most disciplined troops. A mule belonging to one of the regimental water carts, with all its harness on, suddenly broke loose and came tearing down on the front line with its steel drafts crashing round it and making in the dead of night a most appalling row. The men, suddenly startled out of a deep sleep, could not for a moment make out what was happening. Suddenly a stentorian voice boomed out, "The Boers are upon us." It looked for a moment as if a genuine panic had been established, and as if a stampede would have taken place. Fortunately discipline quickly re-asserted itself, and the men were again sound asleep in a few minutes. During the day our guns steadily shelled the Boer position, and under their shelter a pontoon bridge was thrown across the river by which the advanced troops crossed during the afternoon. The hospital bivouacked for the night on the south bank of the river close to the bridge. At 1.45 p.m. on January 18 it crossed the bridge and was parked for the night with the Bearer Company. At 4 a.m. on January 19 I was hungrily watching a lovely rasher of bacon cooking for breakfast when a distinguished staff officer galloped up and asked, "Who are you?" When I answered "The Irish Brigade Field Hospital," he emitted some energetic language and asked why I was not with my Brigade who had already moved off. I hurried the men out of camp, leaving the bacon still simmering on the fire.

That proved to be one of our most trying days. As a road had practically to be constructed for the troops, we spent fourteen hours under a boiling sun in covering a distance of four miles. About 6 p.m. a wounded Boer prisoner was brought into the hospital. He talked freely about himself and the war. Amongst many other things, he said, "I suppose you people imagine you are going to relieve Ladysmith?" We answered, "We are certainly going to try." He smiled broadly and said, "Well, I may tell you this; if General Buller had 100,000 men at his back, aye, if he had every man in England, he would *not* relieve Ladysmith." In other words, the Boers were convinced that the position was absolutely impregnable.

During the day twenty-three cases of dysentery were admitted, practically the first cases we had seen since the campaign opened. They were, however, of a mild, catarrhal type.

At daybreak on January 20 General Warren's Division attacked the Boer position at Spion Kop, the Irish Brigade advancing against their right flank at Rangworthy. At noon the Field Hospital moved up to and occupied Seymour's Farm, situated on the lower slope of the hill. The farm buildings consisted of two clean, commodious, well-ventilated dwelling houses with numerous out-buildings, which stood on sloping, well-wooded ground. There was a good and abundant water supply and also a level grass-covered lawn between the houses. The latter were at once cleared out and occupied as a hospital, and in addition twenty-five tents were pitched on the lawn. During the day 175 gunshot wounds were admitted, and the staff were kept hard at work until 12 midnight.

During the 21st, 22nd and 23rd, heavy fighting continued from early dawn until long after dark, and a continuous stream of wounded reached the hospital. A steady increase in the severity of the wounds was noted. The wounds of entrance had become large, contused and jagged, and those of exit large, funnel-shaped and lacerated. They were, indeed, suggestive of expanding bullets, but as the ground over which the troops were advancing was a mass of gigantic rocks, we conjectured that the worst cases *might* have been caused by ricocheted bullets.

On the evening of the 22nd an incident occurred which shows how unfounded rumours may get about. Just before dark an excited officer rushed into the hospital and reported that the slopes of a conical hill some little distance away were covered with wounded men, and that there was not a single medical officer to do anything for them. Colonel S. Townsend's Bearer Company turned out and spent a good part of the night searching every inch of the ground, but there was not one single wounded man on it!

At 9 a.m. on January 25 I received orders to evacuate the hospital as quickly as possible and fall back on Trichardt's Drift. There were then some 200 wounded in it. The more severe cases were at once placed in ambulances and the slighter ones on ox wagons, and despatched to No. 4 Stationary Hospital at Spearman's Hill. The tents were then struck and with the equipment were packed and loaded on our wagons, and at 11 a.m. we marched for Trichardt's Drift. We bivouacked on the north bank of the drift, and during the night an amusing incident occurred. Many loose mules were wandering all over the camp. About midnight the late Colonel W. B. Allin, P.M.O. of the Field Army, who was sleeping beside me, woke up to find a black object close to him. Thinking it was a mule, he seized a heavy stick and brought it down with a resounding whack on the object, saying at the same time, "Get out of that, you brute!" It turned out to be my best N.C.O., who was looking for something he had dropped in the dark. Fortunately he was not much hurt.

On January 26 we recrossed the Tugela and camped at Spearman's Hill, where our Brigade joined us on the following day.

Casualty returns for the wounded admitted at Spion Kop were submitted to the P.M.O., Natal Army, on January 30, of which the following is a summary: Head, 38; face and neck, 22; chest, 29; abdomen, 16; back and spine, 15; upper extremity, 89; lower extremity, 154; total, 363.

Before leaving Pietermaritzburg the hospital had drawn, by order of the P.M.O., Natal Army, one additional fracture case and three additional antiseptic cases. With these additions the equipment was found practically perfect and sufficient in every way to deal with the large number of cases admitted.

On February 4 I once more received orders to evacuate the hospital and transfer all our cases to the General Hospital. Our tents and equip-

ment were then loaded, and at 1.30 p.m. we marched with our Brigade to Potgieter's Drift. At 5 a.m. on February 5 we moved with our Brigade to Schwartz Kop, with orders to remain in reserve and ready to march at a moment's notice, and two hours later the battle of Vaal Krantz began with a terrific bombardment from the naval guns and howitzer batteries, mounted high above our heads on Mount Alice. During February 6 and 7 we continued in reserve and bivouacked with our Brigade on the lower slopes of Mount Alice. Whilst there we were several times under heavy shell fire.

It was the general impression at the time that Sir Redvers Buller never hoped to get through to Ladysmith at Vaal Krantz, his sole object in the attack being to relieve pressure on the town, as there were persistent rumours that the Boers contemplated making a fresh attack on it. If this was his object it was entirely successful, as the attack never took place.

The Irish Brigade continued in reserve throughout the battle, and from our elevated position on the lower slopes of Mount Alice every move in it was plainly visible to us, and as a spectacle and a display of the cool courage of the troops it was superb. After two hours' bombardment, General Wynne's Brigade forded the river at Potgieter's Drift and made a feigned attack on Brackfontein. When this had developed the plain in front of us, which was perfectly level and destitute of cover, was completely covered with men, at ten paces interval, standing erect and cool as cucumbers. In front of them was the firing line lying down and sending crashing volleys into the Boer position. This continued for two hours, and then, at a word of command, the firing line stood up, turned right about and retired as coolly as if they were on their own barrack square, although every Boer gun and rifle within range was pouring a deadly fire into them. As the first line passed, the second lay down and took up the volley firing, until it in its turn retired. And so on, line after line, until the last man had left the plain. The retirement of the artillery was such a superb display of discipline that, as they passed, the infantry burst into ringing cheers. As soon as the artillery had recrossed the Tugela, the drivers whipped up their horses, galloped into position on the plain in front of Vaal Krantz and opened fire on the hill. There they stood, a long line of guns, on a level plain without a scrap of cover. The enemy's shells burst so thickly amongst them that occasionally the whole line was hidden in a cloud of smoke, but the gunners worked on with perfect accuracy and precision.

About 6 a.m. on February 8 orders were received to fall back on Springfield. The climb, of something like 1,000 feet from the foot of Mount Alice to the plateau above it, was exceptionally stiff and to tired troops seemed little short of perpendicular. To make matters worse, when we were half way up, the disselboom of one of the hospital wagons broke and caused a long and harassing delay. In the afternoon we enjoyed a delightful swim in the Lesser Tugela, thus getting rid of some of the grime which had accumulated during the four days' fighting.

On February 11 reveille sounded at 1 a.m., the earliest hour at which I have ever arisen, and we did a long, hot, and trying march to Chieveley.

Being again on the railway line fresh rations were obtainable, and it was an indescribable treat to taste fresh bread, meat and potatoes once more after long weeks of bully beef and biscuits.

On February 12 the naval guns at Chieveley began again to shell the Boer trenches at Colenso, and this continued daily until the final assault on Pieter's Hill.

On February 14 Lord Dundonald's Cavalry captured Hussar Hill, and by February 18 Cingelo and Monte Christo Hills were also in our hands and the south bank of the Tugela was clear of Boers.

February 15, 1900, will long be remembered by those who took part in the Natal campaign for a gratifying incident, as on that date the chocolate boxes sent out by Queen Victoria were distributed to the troops. On receiving them officers and men turned out, sang the National Anthem and gave three resounding cheers for Her Gracious Majesty. No other gift she could have thought of would have so gratified the troops as that of those lovely boxes bearing her head, her autograph, and her good wishes for the New Year.

After dinner Major Wilkinson said to me, "What, are you not going to sample the Queen's chocolate?" I answered, "No, I shall keep it until Ladysmith is relieved, and shall then eat the first stick of it on the site where Long Tom now stands." That was, of course, said more or less in jest, but I am proud to say I lived to carry it out literally, as will appear later on. I still possess the box I received in Natal and prize it as one of my greatest treasures.

At 10 p.m. on February 21 orders were received to evacuate the hospital as early as possible next morning and to move to Colenso with our Brigade. We were up at 3 a.m., and having transferred about 100 wounded to No. 4 Stationary Hospital, we marched via Hlangwani Hill to the pontoon bridge which had just been thrown across the Tugela. On reaching it we received orders to cross as quickly as possible and to pitch the hospital on a level plain alongside Fort Wylie. The bridge, however, was completely blocked with guns, ammunition wagons and transport of every kind. As we stood in the open waiting our turn to cross, the Boer artillery started to shell the bridge. Fortunately for us their guns were laid just a shade too high, so that the shells passed over our head and burst a few yards to our left, so that we had no casualties. The most trying part of shell fire has always seemed to me to be the shriek of flying fragments—the sound is so creepy and so suggestive of grim possibilities. During General Buller's battles, however, we got fairly inured to it. On reaching our position the tents were hardly pitched before they were crammed with wounded. About 4 p.m. on February 23 the Irish Brigade stormed "Hart's Hill," the stronghold of the whole Boer position, and carried it in brilliant style, but with heavy losses. At 2 a.m. on February 24 we lay down for an hour, but



were again at work at 3 a.m. Finding during the day that the road between the Brigade and the hospital was so swept by fire that the wounded could not be moved over it, we recrossed the river and pitched the hospital on the southern slope of Hlangwani Hill.

On February 25 a three hours' armistice was arranged, so that the wounded in isolated positions might be collected. The sudden cessation of all sounds of battle had a weird, indeed an almost alarming, effect. Fierce fighting continued daily from the first streak of dawn to long after dark.

(To be continued.)

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### Current Literature.

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NORTH, C. E. & PARK, W. H. **Standards for Milk Pasteurization.**  
*Amer. J. Hyg.* 1927, v. 7, 147-73, 2 charts & 1 fig. [26 refs.]

The first part of the paper is taken up with a discussion of the results obtained by earlier workers, the discrepancies disclosed, and the various fallacies and failures in technique which have caused these discrepancies. The technical difficulties are considerable and are given due weight. Naturally, considerable stress is laid upon the extensive work carried out at Endicott in 1922-23 under the directions of MOORE, PARK, ROSENAU, WADSWORTH, ARMSTRONG and NORTH and published in *Bulletin No. 147 of the U.S. Public Health Service*. Their conclusion is that tubercle bacilli are killed at 138° F. in 30 minutes, and that 142° F. for 30 minutes is a standard for pasteurization that provides a margin of safety sufficient to protect the public health against milk-borne infections.

The second part of the paper describes a further series of experiments upon the effect of low temperatures on the tubercle bacillus. A bovine strain was used which had been artificially cultivated for several years and was one of high virulence. The suspension used was such that each c.c. of milk contained about 20 times the quantity of tubercle bacilli necessary to kill a guinea-pig by inoculation. Most of the experiments were carried out with a lead coil apparatus which, being completely filled with milk, avoided pellicle, foam or splash. The exact technical details are described in the paper and seem unobjectionable. By withdrawing milk after definite time intervals of heating, rapidly cooling, and testing upon guinea-pigs it was possible to plot out a time-temperature curve. With one or two exceptions, ascribed to laboratory errors, the results were concordant. This curve is shown in the chart.

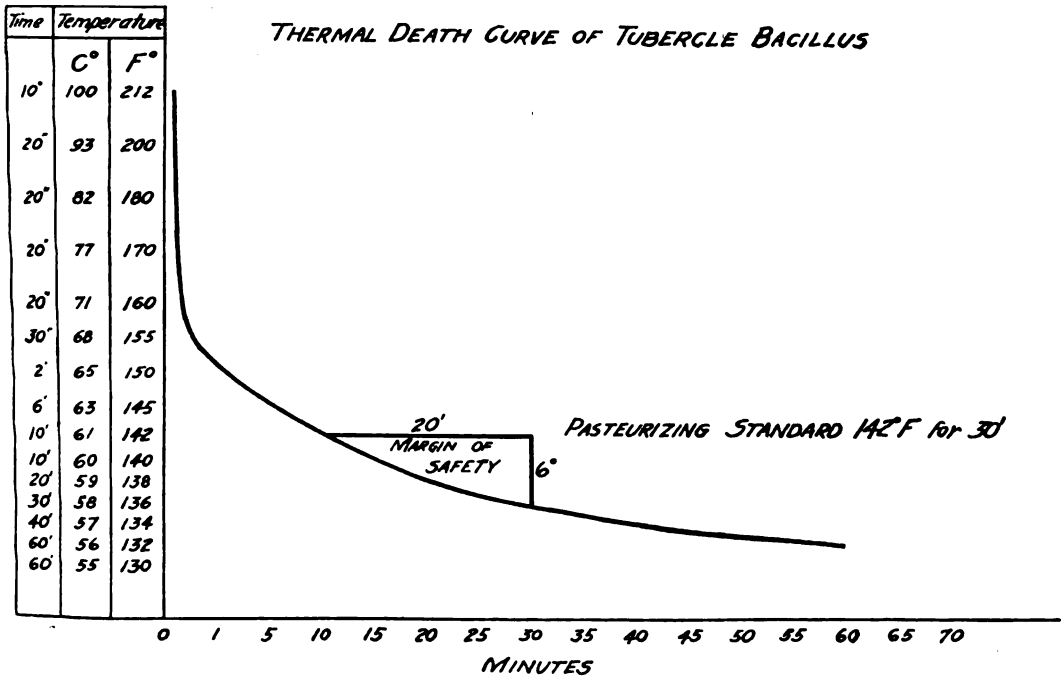
With such a thermal death curve of the tubercle bacillus it is possible to select a wide range for heat treatment of the milk, adopting either a higher temperature with a short time or a lower temperature and a long exposure period. For practical pasteurization purposes 138° F. for 30

minutes is considered adequate, but to allow a margin of safety the working standard of 142° F. for 30 minutes is advocated. They point out that an additional safety margin is furnished by the fact that the experimental work is by inoculation while natural human infection is by ingestion. They suggest that this margin of safety is ample for all purposes within the range of irregularities in the operation of pasteurization,

TUBERCLE BACILLUS  
KILLED

CHART No 2

## THERMAL DEATH CURVE OF TUBERCLE BACILLUS



(NORTH-PARK-1926)

Thermal death curve of bovine tubercle bacillus in milk.  
[Reproduced from the *American Journal of Hygiene*.]

and covers everything except ignorance or dishonesty on the part of operators, and for this no margin is large enough. [The engineering difficulties have been discussed by PHELPS: see this *Bulletin*, v. 1, p. 279.] In practice, therefore, there is no case for a wider margin of safety, and to adopt, for example, 145° F. is unjustifiable and by changing the appearance of the milk may discredit pasteurization.

W. G. SAVAGE.

Reprinted from "*Bulletin of Hygiene*," Vol. 2, No. 9.

SCHULTZ, O. Untersuchungen ueber die Einwirkung ultravioletter Strahlen auf Milch. [Action of Ultra-Violet Rays on Milk.] *Ztschr. f. Fleisch. u. Milchhygiene*. 1927, v. 37, 131-5, 1 chart; 183-5, 1 fig.

The 'activation' of foodstuffs, including milk, has come into prominence in view of the possibility of causing, by ultra-violet radiation, an origination or increase of antirachitic vitamin D. [The reference to vitamin E in this connexion is evidently in error.] The author has made an examination into the effect of the irradiation of milk from a number of other standpoints, on which little information is available. The source of ultra-violet light used was the mercury vapour lamp.

The appearance of milk so treated undergoes changes; as exposure is prolonged there appear flocculi and a yellow pellicle. After thirty minutes exposure the milk acquires a yellow colour, to be related to the caramelization of sugar. The smell alters; while the milk is being irradiated there is a smell of ozone, and this persists even when the milk is taken to another room; longer exposure causes it to acquire a musty, burnt smell. The taste becomes similar to that of whale-oil (*tranähnlich*) under sufficiently lengthy exposure.

There occurs a diminution of the water content and a consequent rise in specific gravity. There is a prolongation of the clotting time with rennet under the influence of the rays. A careful examination of the ferments of milk shows that they are weakened and finally destroyed. These phenomena have some resemblance to the effects of heat, but take place at relatively low temperatures.

R. G. BANNERMAN.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 9.*

ECKFORD, M. O. Thermophilic Bacteria in Milk. *Amer. J. Hyg.* 1927, v. 7, 201-21. [22 refs.]

The thermophiles from milk and milk products are divided into two groups, i.e., *obligate thermophiles*, which developed from 42° to 63° or 75° C., with an optimum between 50° and 60° C., and *thermotolerant* organisms, which developed from 35° to 70° C. and 75° C., with an optimum between 50° and 60° C. Their cultural and other characters are described. Both groups have little or no proteolytic properties, and their fermentative activities are slight or absent. They have little or no effects as regards damage to milk or other foods. A thermophilic streptothrix was, however, isolated which was proteolytic and may be of significance in the ripening of cheese.

Both groups survived pasteurization and even 100° to 120° C. for 15 minutes. The obligate thermophiles were found not to multiply in milk at 62° C., but the thermotolerant strains multiplied greatly at this high temperature and particularly at 55° C. These strains, therefore, may cause

trouble to pasteurization plants by multiplying during the process and giving the milk a high count. They may cause pin-point colonies in plates from pasteurized milk at 37° C. They were not found by this author in canned milk, sweetened or unsweetened.

W. G. SAVAGE.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 9.*

ENGLAND AND WALES. **Census of England and Wales, 1921. General Report with Appendices.** Pp. vii + 211. With 9 diagrams and 1 chart. 1927. London: H.M.S.O. [5s.]

The General Report on the Census of England and Wales, 1921, published by His Majesty's Stationery Office, completes the series of official volumes which have been issued in respect of the 1921 Census.

The Report commences with an account of the taking of the Census and of the difficulties encountered and then deals successively with the various statistical interests to which the Census has contributed. The principal subject headings are as follows:—

Population—numbers, growth and distribution.

Housing.

Sexes, ages and Marital condition.

Occupations and industries.

Birth place and Nationality.

Dependency, Orphanhood and Fertility.

Welsh Language.

Workplaces—in relation to residence.

The first section deals with the numbers of the population, its distribution throughout the country, its growth since the preceding census in comparison with that of earlier periods and also with the contemporaneous growth of other nations. The population numbered rather more than 37½ millions, 649 to each square mile on the average or about an acre per head, a density greater than that of any country in the world for which statistics are available. Though an increase has been recorded at every census, the rate of growth between 1911 and 1921 was smaller than that of any preceding decade, for which the war must be mainly responsible. It compares favourably in this respect, however, with other European belligerents, whose populations generally advanced at a much slower rate or even declined.

Nearly 80 per cent. of the population were enumerated as living in urban areas, and of these practically half were found in comparatively dense aggregates represented by the 46 towns each containing more than 100,000 persons. The rate of growth of the smallest towns is above the average for the whole country, and the rate appears to increase as the towns get larger, until the populations reach a figure in the neighbourhood of 100,000. After this the rate of increase tends to slacken off, suggesting that 100,000 roughly marks a limit of effective aggregation beyond which the

advantage of further accretion begins to be offset by counter-balancing disadvantages. Prominent amongst the towns which showed little increase or which decreased during the decennium are those associated with the textile industry in Lancashire and Yorkshire.

Housing accommodation is discussed from various points of view. Attention is called to the fact that, notwithstanding the house shortage, the total number of rooms available for habitation is greater in relation to the population than it was in 1911. At the same time, families are, on the whole, smaller than they were 10 years ago, and since small families are able to command a higher standard of housing than the larger, they have absorbed a greater share of the available house room than they had in 1911. It is largely to this change and to the uneven distribution of accommodation throughout the country that the present situation is due. The proportion of population living under the overcrowded conditions of more than 2 persons per room has increased from 9.1 per cent. in 1911 to 9.6 per cent. in 1921 for the country at large; in Northumberland and Durham, however, as much as 30 per cent. of the population are placed in the overcrowded category, while in London the proportion is as high as 16 per cent.

In the "Ages" section will be found the most direct evidence of the effect of the War. The depletion of males at early adult ages and the deficiency of very young children of both sexes stand out as prominent features of the age curves. The losses at the younger ages automatically result in a general ageing of the population as a whole, a change which has been further accelerated by the improved vitality of the middle-aged registered in recent years. In the matter of sex distribution also the war has been responsible for a greatly increased disparity in numbers, the surplus of women now exceeding 1,700,000, as compared with less than 1,200,000 in 1911.

Amongst the marriageable population the disparity is naturally greater, and we find that between the ages of 30 and 35, for example, there are 1,470 unmarried females for every 1,000 unmarried males. The preponderance of women is also strongly marked at the old ages to which they survive in far greater numbers than do their male counterparts.

The relative importance of the various occupations in different parts of the country is discussed in another section. The proportions occupied at various ages are compared with those at the preceding census. The very marked decrease in child labour is pointed out.

One of the features of the Birth-place and Nationality statistics is the comparatively heavy reduction which has occurred in the number of aliens in the country, from a proportion of 790 per 100,000 total inhabitants in 1911 to 602 in 1921.

To those interested in problems relating to Pensions, Invalidity Allowances, Workmen's Compensation and such like matters the new Dependency and Orphanhood section, which provides a survey of the sizes, age constitution and distribution of economically dependent

families in relation to their parents, should prove instructive. In a certain number of families there were as many as 13 children returned as being under 16 years of age, but the comparative rarity of the large family in general is exemplified by the average, which for all married men taken together measured only 1·27 children for each married man. More than 43 per cent. of the married men returned 0 children under 16, while in another 23 per cent. there was 1 child only. Miners returned the largest families on the whole, but even so their average was only 1·82 for each married man, while in the case of professional men the figure sinks as low as 0·90.

The fertility study shows how the probability of birth varies with the age of the parent, with the number of children already in existence and also with the occupation of the father.

The Report concludes with a review of the material provided by the new enquiry regarding work-place. The distribution of the population in its working capacity is contrasted with the more usual distribution by residence, and attention is drawn to the important tides of ebb and flow which daily take place in all parts of the country. H. M. WOODS.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 9.*

REGISTRAR-GENERAL ENGLAND AND WALES. **Statistical Review of England and Wales for 1925. Tables. Part I. Medical.** (New Annual Series) No. 5. Pp. iii + 520. 1926. London: H.M.S.O. [15s.]

This volume forms part of the annual series of official publications of vital statistics which have taken the place of the Registrar-General's Annual Report. The present volume consists of tables of births, deaths, and causes of deaths in all areas of England and Wales and also comprises the annual figures of the notifications of infectious diseases.

The estimated population for 1925 was 38,890,000 persons. The death rate (standardized) was 10·7 per 1,000 living and was the same as that recorded in the previous year. The rate of infant mortality was also unchanged compared with that for 1924 (75 per 1,000 births). The birth rate was 18·3 per 1,000 persons. The death rates at ages are given for each year from 1885 for the sexes separately. The death rates per 1,000 at ages during 1925 were as follows:—

				Males	Females
0-	..	..	..	25·3 (25·1)	20·7 (20·2)
5-	..	..	..	2·5 (2·4)	2·4 (2·2)
10-	..	..	..	1·7 (1·6)	1·7 (1·7)
15-	..	..	..	2·6 (2·5)	2·5 (2·5)
20-	..	..	..	3·3 (3·4)	3·1 (3·1)
25-	..	..	..	3·9 (3·9)	3·4 (3·5)
35-	..	..	..	6·3 (6·5)	4·8 (5·0)
45-	..	..	..	11·6 (11·5)	8·6 (8·6)
55-	..	..	..	24·5 (24·9)	18·1 (18·9)
65-	..	..	..	59·6 (60·0)	46·2 (47·3)
75-	..	..	..	140·2 (137·5)	115·8 (116·0)
85 and up ..	..	..	..	290·0 (271·4)	269·1 (249·5)
All ages standardized	..	..	..	11·9 (11·8)	9·7 (9·7)

The figures in brackets refer to the year 1924.

The crude death rate from tuberculosis showed a further decline and was the lowest yet recorded in both sexes—1,195 per million for males and 895 for females. On the other hand mortality from cancer was the highest on record, 1,290 per million for males and 1,377 for females. The death rates from measles, whooping cough, diphtheria and scarlet fever were all in excess of the previous year, while mortality from diseases of the respiratory system showed a decline.

The death rate from diabetes showed a considerable increase in females (125 per million against 116 for 1924) whereas for males the mortality from this cause has been declining since 1922 (98 per million in 1925 against 116 in 1922).

H. M. WOODS.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 9.*

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## Reviews.

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THE ANOPHELINE LARVÆ OF INDIA, CEYLON AND MALAYA. By C. Strickland, M.A., B.C.(Cantab.), and K. L. Choudhury, M.B., D.P.H.(Cal.). With a Foreword by Sir Ronald Ross, K.C.B., K.C.M.G., F.R.S. Calcutta: Thacker Spink and Co. 1927. Pp. 67, with numerous illustrations. Price Rs. 4/8.

This small book, the subject matter of which is indicated by the title, should prove very useful to all who are interested in antimalarial work in the tropics, especially as the price brings it within the reach of all.

Chapter I deals with the collection of larvæ and the most suitable clothing for the purpose. The information is clearly given, and should give much help to those carrying out this work. The much-bemedalled gentleman who turns out to collect larvæ is rather exceptional, but it is well to draw attention to the fact that only the oldest and most comfortable clothing should be worn on such occasions.

Chapter II gives very useful information as to how the best use may be made of the field collection.

The identification tables give all the details necessary for distinguishing the larvæ of the various species, without unnecessary "padding," and in their present arrangement are lucid and easy to work with.

The illustrations bring out all the chief points of distinction in a clear manner.

Appendix I refers to the catching of adult mosquitoes, so it might have proved useful if such articles as entomological pins, celluloid strips and collecting boxes had been included in the list of necessary equipment given in Appendix II, as otherwise collectors might overlook these when going out on a prolonged survey.

Appendix III deals with the staff required for the work.

Appendix IV gives information regarding the packing of specimens for posting and, although the book deals chiefly with larvæ, a few notes on the transmission of adults might have been included.

Appendix V is divided into two subsections (a) and (b). The former deals with the geographical distribution of the species, and the latter with the commoner habitats of the species, as larvæ. Both subsections give very useful information, but it is hoped that, at a later date, further information on the distribution may be available, the names of the various cantonments in which the species are found would prove invaluable to medical officers and others employed on antimalarial work, but obviously the size of the present publication does not allow for such an extension of the list already given.

J. E. M. B.

PRACTICAL TROPICAL SANITATION. By E. P. Minett and A. G. M. Severn. London: Baillière, Tindall and Cox. Price 5s. net.

It is difficult in a small manual of this nature to know how much information to give and how much to withhold, but the authors have succeeded in comprising, within a compact book of suitable size, much that will be of value to sanitary inspectors and others in the tropics.

The subject matter is well arranged in eleven short chapters and an appendix.

Chapters IV, X and XI are particularly good, and contain much valuable information and advice not infrequently omitted from similar publications.

Chapter IV deals with food, markets and abattoirs; Chapter X with education, legal processes and regulations; and Chapter XI with schools and child care; all of which have an important bearing on health in the tropics and elsewhere. Chapter XI ends with some useful data, and these might with advantage be extended.

Of the other chapters, No. 1 offers advice as to the methods of life best suited to the tropics, and some of this advice is open to criticism, as, for example, that recommending crêpe rubber-soled shoes when suffering from irritation and swelling of the feet; cotton socks in preference to woollen ones, etc.; and I can well imagine a resident in the tropics, after two substantial meat meals a day, when offered a breakfast of raw eggs and buttered toast, replying, as did the native butler when interrogated as to the hour at which his master breakfasted: "Sahib does not breakfast, he is sick at 10 a.m.!"

It would be an improvement if the last two paragraphs of this chapter which deal with "Reading and Qualifications," were transferred to Chapter X, or were given a distinct heading instead of coming under the headline, "*To Waterproof Clothing.*"

Chapter II deals with water supplies. The advice given in paragraph 2: "Never under any circumstances drink unboiled water in tropical countries," appears to be discounted later on, where it is wisely pointed out that boiled water, unless carefully protected after boiling, may be unsafe. In regard to purification with alum and chlorine, I think the



"rough and ready" quantities of alum and chloride of lime recommended on page 13 are too rough and ready to be relied upon for rendering a heavily-polluted water potable, and consider that all sanitary inspectors should be capable of applying the Horrocks test.

I have never known sodium sulphite to be used as a water sterilizant, the tablets commonly used are made of sodium bisulphate.

Chapter III deals with sewage and refuse disposal, and is well illustrated by diagrams. Under "Soakage Pits," line 2, "trenches" should read "benches."

Chapters V and VII deal respectively with "Mosquitoes, Classification and Prophylaxis," and "Buildings and Construction."

Chapter VI, on "Tropical Diseases," contains much useful information, but I deprecate the use of a sponge instead of separate pledgets of cotton-wool for the primary cleansing of arms when preparing them for vaccination, and I think recent investigations tend to incriminate *Phlebotomus argentipes* rather than the tick, bug or flea as the vector of kala-azar.

In Chapters VIII and IX, which cover respectively "Port Sanitary Work" and "Disinfectants in Common Use," and "House Disinfection," no distinction is made between "disinfection" and "disinfestation," and, I presume, because of this omission sulphur dioxide is described as a disinfectant for ships and rooms.

I imagine few modern sanitarians would be satisfied with this method of disinfection; as the authors themselves quote later on from Professor Kenwood: "All room surfaces can best be disinfected by direct spraying or washing with a liquid disinfectant."

This chapter would be improved if fewer disinfectants were mentioned, and if only a few reliable methods of disinfection and disinfestation were described.

Serbian barrels and similar improvised disinfectors give better results when converted to downward displacement steam.

Sanitary inspectors should be told how to protect their eyes when using formalin sprays.

As will be noted the defects are few and the manual fulfils the authors' intention of supplying a most useful pocket book for sanitary inspectors and others proceeding to the tropics.

P. H. H.

CYSTOSCOPY. By Jas. B. Macalpine, F.R.C.S. Bristol: Wright and Sons, Ltd. Large 8vo. Pp. xvi + 272. Price 25s. net.

This book has been written with the object of assisting the general surgeon, who has not the opportunity of using the cystoscope with sufficient frequency to become skilled in its employment. The author begins with a description of the modern cystoscopes and their evolution. A chapter full of useful detail is next devoted to the routine examination of a urological case. Stress is laid on the fact that the complete overhauling of the patient is a process which should extend over several days, and that much time may be wasted by haphazard examinations. The cystoscopic

appearances of the normal bladder are fully described, and a chapter is devoted to the changes in the bladder resulting from physiological and pathological changes in the uterus. Subsequent chapters deal in great detail with the cystoscopic appearances resulting from the various pathological conditions arising in the bladder, prostate, ureters and kidneys. The technique of ureteric catheterization and pyelography is fully described. A chapter is devoted to renal function tests, and the author rightly lays emphasis on the fact that although these tests are valuable, they must not be allowed to usurp a too important position, and should only be considered alongside the clinical features.

The book is well and profusely illustrated. There are 181 illustrations; in addition there are 12 coloured plates, which have been beautifully reproduced and which depict 71 different cystoscopic appearances.

The work is a thoroughly practical one, and the author and publishers are to be congratulated on having produced a book for which there is a real need, and which should be in the hands of every junior surgeon.

D. McK.

**THE SCIENCE AND PRACTICE OF SURGERY.** By W. H. C. Romanis and P. H. Mitchiner. In two volumes. London: J. and A. Churchill. Price 28s. net.

This work adds one more to the many textbooks of surgery for students and practitioners. Written as it is by two experienced teachers of surgery, it forms a notable addition to our surgical literature.

The authors state in their preface that their main object is twofold: firstly, to supply the student with a textbook to enable him to prepare for the ordinary pass examinations or for the higher surgical qualifications such as the F.R.C.S.; and, secondly to supply the practitioner with a book which will be of value for reference.

Vol. I deals with general surgery. In this are included useful chapters on amputations and excisions, X-rays in diagnosis and treatment, and anæsthesia. The sections dealing with fractures and dislocations are particularly good. The chapter on tumours is well illustrated by beautiful drawings of microscopic preparations, and should prove of great value to those preparing for surgical examinations.

Vol. II deals with regional surgery. Each section is prefaced by a concise and practical account of the applied anatomy and physiology of the region or organ discussed.

Although the book is not meant to replace the various treatises on operative surgery, it contains a description of the salient points of most of the important operations together with an account of their indications and difficulties.

Perhaps one of the most important features is the attention paid by the authors to surgical after-treatment, an aspect which is too often neglected in the average textbook and which is of more importance to the student and practitioner than a description of obsolete operations or a detailed discussion of surgical technique.

The illustrations form another important feature of the book. They are numerous and well produced. The authors appear to have carefully avoided the inclusion of illustrations depicting the rarer surgical conditions so often seen in textbooks. The book has been carefully written and is well proportioned. It is essentially practical and gives a thoroughly up-to-date account of current surgical teaching, and should be of great value as a textbook for examinations or as a work of reference for practitioners.

D. McK.

REPORT OF THE OSLO CONFERENCE ON THE HEALTH OF MERCHANT SEAMEN. 1926. Pp. 216.

We have received a copy of the Report of the Oslo Conference on the Health of Seamen from the director of the publications service of the League of Red Cross Societies, which appears to be responsible for the printing and publishing of the report. The Conference took place between June 28 and July 5, 1926, on the invitation of the Norwegian Red Cross Society, and under the auspices of the League of Red Cross Societies. It was attended by delegates of twelve countries, including China, Japan and Costa Rica. While other countries contributed only one or two delegates each, Great Britain was represented by five, two each from the British Red Cross Society and Social Hygiene Council, and one, Colonel L. W. Harrison, from the Ministry of Health. The International Labour Office, the International Red Cross Committee, the League of Nations and the League of Red Cross Societies were also represented. The Conference held its meetings at Oslo, Bergen and Trondhjem, and the first part of the Report, which is in two parts, is made up of the papers read and speeches made by various delegates and others, at each of these places. The second part of the Report consists of memoranda submitted to the Conference by various maritime countries on the measures taken, legislation and otherwise, for improving the conditions of life and prevention of disease in the Merchant Marine of their country. It concludes with a series of six resolutions recommended by the Conference.

The chief topic of discussion was the prevention of venereal disease by international measures such as the provision of facilities at each port throughout the world for prophylaxis and treatment, a measure which it may be noted was proposed some years ago by the services Committee of the British National Council for Combating Venereal Diseases. The N.C.C.V.D.'s proposal has considerably advanced since then, and led to the Brussels Agreement of December 1, 1924. The chief measure advocated by the Oslo Conference, in furtherance of the objects of this agreement, is the provision at seaports throughout the world of bureaus for furnishing treatment or information as to where appropriate medical advice and treatment can be secured. Such seamen's bureaus, it is recommended, should be distinguished by a common badge of world-wide application. Norway appears to have established something of the kind at each of its seaports, and in addition has prepared a medical manual for ships carrying no doctor,

and also a medical chest. It was further recommended that a Standing Committee should be appointed by international organizations, such as the International Labour Office and Health Department of the League of Nations, to investigate facilities for medical treatment of seamen, by standardizing ships' medicine chests; medical manuals, a wireless code for medical consultation at sea; education of ships' officers in first aid and use of medicine chests, and health propaganda amongst seamen. The Report covers a fairly wide field in connexion with such topics and is well worth reading.

**THE THOMAS' SPLINT AND ITS MODIFICATIONS IN THE TREATMENT OF FRACTURES.** By Meurice Sinclair. Oxford University Press. Demy 8vo. Pp. xiv + 168. Price 15s.

This little book represents the specialized work of the author during the war. To those interested in the treatment of fractures, Major Sinclair requires no introduction, so great was the reputation he made whilst in charge of the fracture wards at No. 8 Stationary Hospital, Boulogne. A book written by one with such a wide experience will be welcomed with a feeling of gratitude.

A preliminary chapter deals with the question of amputation and some of the complications of fractures. A full description is given of the use of the 'Thomas' splint and its modifications for both the upper and lower limbs. In addition the author describes many useful devices of his own for the treatment of fractures and amputation stumps.

Whilst the Thomas' splint is one of the simplest and most efficient methods of treating fractures of the femur, yet many surgeons have had disappointing results from its use. In the majority of cases these have been due to lack of attention to detail in the application of the splint and in the subsequent management of the case. All these details are fully and carefully dealt with by the author.

There is also included a chapter on the treatment of wounds of the soft parts and another on radiography in the treatment of fractures. Both chapters are thoroughly practical and full of useful hints.

The book is amply illustrated by photographs of apparatus and radiograms.

It should be in the hands of all who have to deal with the treatment of fractures.

D. McK.

**MALARIA—ITS INVESTIGATION AND CONTROL WITH SPECIAL REFERENCE TO INDIAN CONDITIONS.** By Robert Knowles, Major, I.M.S., and Ronald Senior-White, Malaria Research Officer, Central Malaria Bureau, Government of India. Calcutta: Thacker Spink and Co. 1927. Pp. vi + 220. Price Rs. 7/8.

Whilst primarily intended for medical men of the assistant surgeon class, there is much in this small volume worth the attention of medical men of other grades.

Chapter I gives a very lucid account of the malaria parasites—the illustrations are excellent and at the end is found a useful tabular summary of the morphological characters of the three recognized species.

Chapter II deals with the mosquito cycle and *inter alia*, gives some interesting data on the ætiology of relapse, malarial rigor, congenital malaria and blackwater fever.

In Chapter III ("Practical Laboratory Work and Diagnosis in Malaria") stress is laid on the advantages of thick as compared with thin film examinations and a method is described whereby the two can be carried out on the same slide, using Leishman's stain.

In the chapter on the treatment of malaria details of various forms of quinine therapy are given and there is a strong denunciation of intramuscular injection with an appreciation of the intravenous method. Under the heading "Prophylactic Quinine," it is pointed out that this acts as very early treatment of a malaria infection rather than as a preventive.

Chapter V gives a very comprehensive account of the carrying out of a malarial survey with emphasis laid on the necessity of identifying the carrier species in individual localities as the basis of antimalarial measures. "It is useless spending money killing off species which do not carry malaria, and in every antimalarial scheme, on the mosquito side, only species control is to be aimed at."

Undoubtedly the ideal but general measures of mosquito destruction certainly add to the amenities of life in an Indian cantonment. In the appendices are found notes on the breeding places and distribution of the Indian anophelines and keys to the adults and mature larvæ of the genus *Anopheles* in the Indian subregion. The book is certainly one which should appeal to officers of the Royal Army Medical Corps.

DEMONSTRATIONS OF PHYSICAL SIGNS IN CLINICAL SURGERY. By Hamilton Bailey. Bristol: John Wright and Sons, Ltd. 1927. Pp. xv + 217. 21s. net.

This little book is the outcome of a series of demonstrations of physical signs given by the author.

The author rightly lays stress on the fact that the history and physical methods of examination must always remain the main channels by which a diagnosis is made, and that X-ray and laboratory methods should be used as confirmatory tests.

The book begins with a general description of the methods of eliciting the more basic physical signs, such as fluctuation, translucency, etc. After this follow chapters which deal with the examination of the various regions of the body. Those dealing with the breast and abdomen are particularly good. Some very useful hints are given on the examination of the carpus in cases of suspected fracture of the scaphoid and semilunar—conditions which are unfortunately too often missed. In dealing with the examination of the hip region no mention is made of Chiene's parallel

lines, which afford a simple and efficient means of demonstrating upward or downward displacement of the great trochanter. It is regrettable that in describing Trendelenberg's sign no explanation is given of the mode of production of the alteration of the level of the gluteal fold. This sign is one which causes much confusion in the mind of the average student, and yet it is capable of quite a simple explanation. These, however, are small points and do not materially lessen the utility of the book. The printing and illustrations leave nothing to be desired. The latter form an important feature of the book. They are numerous and indicate the points clearly. In many cases they convey their own interpretation so well that they make the text almost unnecessary. The book is full of useful information, much of which will not be found in the ordinary surgical textbook. It should prove invaluable to students and junior teachers of clinical surgery. At the same time it will be of use to those preparing for the higher surgical qualifications. The price is high for a relatively small book, but probably the large number of original illustrations account for this.

D. McK.

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### Notice.

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#### NEO-REARGON.

WE have received from Messrs. H. R. Napp, Limited, a specimen of neo-reargon, a new compound of silver and anthraquinone glucosides, which has recently been introduced for the treatment of gonorrhœa. It is claimed that anthraquinone glucosides, in addition to possessing gonococcicidal and marked penetrative powers, have an analgesic value of a hitherto unobserved power. The combination although containing 14 per cent of silver is, therefore, absolutely painless in action and is stated not to cause inflammatory reaction when used in 2½ per cent solution as an injection. It is also recommended for use in ophthalmic work when silver solutions are indicated. Though it causes stains on linen, it is claimed that these disappear in the washing.

## Correspondence.

## TROPICAL HOUSING.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—The appearance in a recent number of the Journal (July) of an article on "Tropical Housing" prompts me to extend certain remarks which I made on the same subject in my narrative of a voyage to Central America, wherein I contrasted American and British methods of tropical architecture—to the considerable disadvantage of the latter—and in which, also, I adumbrated some of the conclusions at which your later correspondent seems to have arrived.

Nothing is so remarkable as the disseverance between the discoveries in tropical medicine and their practical application in the ordinary life of officers stationed in hot climates. Houses which I have seen erected within the last few years in India and Egypt seem to have been designed by people who have never been outside the British Isles, and who know, and care, as much about climatic conditions as a rabbit does about eugenics. I have in mind two sets of houses built in India—not by Government this time; the one in a railway colony outside a largish city, the other to accommodate employees of some large mills down by a great river. Both these might well have suited the artisan class in a suburban area at home; in India they were simply death traps. The rooms were small, low, thin-walled, and ill-ventilated—one could find nothing more conducive to heat stroke. Probably the architect had never heard of heat stroke, or thought it was like the measles, inevitable for some people, anyhow.

I came early to the conclusion that there is one suitable type of building for very hot climates—the old Indian bungalow. It was my lot in the early years of my service to live in many of them. Some were so old they had stood in the Mutiny, and were even reputed haunted; and though I dislike ghosts, as objects that cannot be scientifically labelled, I would rather share my house with them and with sandflies and mosquitoes, than suffocate in a cottage in a night temperature of 110° F. These old bungalows arose out of the climate; they were discovered and used by men who had to pass their lives in it. The men were no fools, and we may take it that long experience proved to them that the bungalow of the country was the dwelling best fitted to it. I do not say the bungalow has no defects, but I do say that it typifies what a building for India or the hot parts of Africa should be.

Essentially, it is lofty, spacious, thick-walled, and thick-roofed. It is built of what builders in this country would call "clay lump," practically mud or "mutti." It has small dormer windows under the eaves, high up. These I consider necessary, for in a lofty room the "residual air" above the doors and windows must not stagnate and become a reservoir of foulness. Broad and substantial verandahs shelter it on all sides. Communicating doors are wide and lofty. Large fireplaces with tunnel-like shafts rising from them in the thickness of the wall were a feature of these

old bungalows, though one had fires in them, perhaps, three days of the year, if as many. But they were fine ventilating shafts, and ought not to be abolished. With that fine sense of misplaced economy, so characteristic of our times, the builders have omitted them from the new houses.

I had an adequate lesson in heat stroke and its ætiology when I was superintendent of a central jail outside a big city. It fell to me for a space to perform also the duties of civil surgeon, and it happened to be the first week in July, about the most dangerous week in India. The air, long superheated by months of an unclouded sun, filled up with moisture, the sky grew leaden and hung over the earth like a sodden blanket. In that week ten whites perished of heat stroke in the city and over a hundred Indians. In my jail, wherein I had 1,600 convicts, I had not a single case, fatal or otherwise. Obviously there was no accounting for this display of eclectic mortality but by the closeness and stifling stagnation of air in the city and the free circulation of it in the jail. It was a lesson on a large scale of what might happen in lesser degree as between the new type of pokey little house and the big rambling hall of the old days, and to the families that happened to be living in them.

Squadron Leader Keane is very right when he states that the problem is one for the physicists. The postulates of the medical men are already clearly formulated; it rests with the physicist and the architect to give effect to them.

One may ask, why it is that mankind, who originated in hot countries, have discovered a means of keeping warm, but, so far, have found no means of keeping cool? The answer is partly in their migration to cooler climes: they found the problem insoluble. But with fans and ice and proper building methods the difficulty begins to yield, and when some inspired inventor discovers how to permeate a hot apartment with coolth, not in the form of a draught but as a cold glow (if I may use the term) at a cheap rate, one of the great terrors of tropical life will be laid low. In my article on "Honduras" I pointed out how this great comfort is lavished on the banana—the amount of pampering a banana goes through before it reaches the coster's barrow would hardly be believed—and suggested that ere long it might be afforded to human beings. It does seem illogical, too, that if meat can be kept in a cold store, the human beings for whose consumption it is designed cannot have a cold store to sit in, when it is not altogether a question of comfort or luxury, but often one of life and death.

I feel this is so important a question, and there is so much more to be said on it, that I would advise any young officer going out to India to make a special study of it; for as the Tropics are bound to bulk larger and larger in our daily life under the steadily growing impulse of economic pressure, so the problems that affect life in them are going to grow more clamant for settlement and to bring greater rewards to those who find solutions to them.

I am, &c.,

A. W. HOWLETT,  
Major R.A.M.C.



## Notices.

### EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Any demand for reprints, additional to the above, or for excerpts must be forwarded at the time of submission of the article for publication.

Notices of Births, Marriages, and Deaths are inserted in the *Corps News and Gazette*, free of charge to subscribers. All communications should be written upon one side of the paper only; they should by preference be typewritten; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," War Office, Whitehall, S.W.1.

The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

### MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, a volume commencing on 1st July and 1st January of each year.

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Subscriptions for the *Corps News and Gazette* separate from the Journal cannot be accepted from Officers on the Active List unless they are also subscribing to the Journal.

The *Corps News and Gazette* is not on public sale, but obtainable only from the Manager, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

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# In Memoriam.

---

W. G. M.

*January, 1858 - October, 1927.*

DAME WINTER had her mantle spread  
To greet the outset of his earthly span,  
And Spring and Summer timely shed  
Their lustre on the youth, and man.  
But golden Autumn, richly crowned  
With fruits of toil, of love and thought,  
Her harvest reaped ; and free, unbound,  
His Soul new realms of service sought.  
Let songs of gladness dull the ache  
Of poignant grief his passing gives,  
As we from him this message take—  
Life's joy is service ; so one lives.  
His gift to men to ease their pain,  
An honoured mem'ry now his gain.

G. M. S.

*October, 1927.*





Authors are alone responsible for the statements  
made and the opinions expressed in their papers.

# Journal of the Royal Army Medical Corps.

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## Obituary.

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MAJOR-GENERAL SIR WILLIAM GRANT MACPHERSON,  
K.C.M.G., C.B., LL.D.

THE Corps has sustained a great loss by the death of Sir William Macpherson, one of its most distinguished Colonels Commandant. He was a skilled administrator, and before the War was regarded as a great exponent of medical tactics. He was a good linguist, and translated "The Strategical and Tactical Employment of the Medical Service as carried out in an Army Corps by Maximilian, Ritter Von Hoen, of the Austro-Hungarian Army," a work which, for many years, was closely studied by officers holding administrative appointments. It is no exaggeration to say that his enthusiastic study of this subject laid the foundations of the successful medical arrangements in the late War.

As editor-in-chief of the "Medical History of the War" Sir William Macpherson had another claim to fame. He possessed just those qualities which the task demanded, and his work will always rank as a model of its kind; a history in which everything of real value has found a place, and from which everything irrelevant has been excluded. When the work was in preparation he told the contributors that its chief object was to prevent the recurrence of errors committed in the past, and should a time of testing ever arise there is little doubt that the object will be achieved.

William Grant Macpherson was born at Kilmuir, in Ross-shire, on January 28, 1857, the third son of the Rev. William Macpherson, of Kilmuir. He was educated at Fettes College, being one of the original fifty-one boys with which the school opened in 1870, under Dr. A. W. Potts. From Fettes he proceeded to Edinburgh University, where he

graduated M.A., with honours in classics, and was Greek Travelling Scholar. Taking up medicine as a profession he combined the study of classics with medicine, and obtained the degrees M.B., C.M. in 1882. Having a travelling scholarship he then proceeded to Tübingen and Leipsic, where he acquired his knowledge of German, which proved so useful to him later on in his career.

He joined the Army as a surgeon in 1883, and his first tour of service was in India. His next tour was in Gibraltar, where, having obtained the D.P.H. Cambridge, he was appointed Medical Officer of Health. While at Gibraltar he was sent in medical charge of Sir C. Euan Smith's Mission to Fez in 1892, and of Sir A. Nicholson's Mission to Morocco city in 1896 ; experiences which he delighted to recall.

On return from Gibraltar he joined the Staff of the Director-General at the War Office, being appointed D.A.D.G. in charge of A.M.D. 2, a department dealing with medical statistics, hospital accommodation, prevention of disease, and the preparation of the Blue Book—work for which he was peculiarly well fitted. While at the War Office he was selected to attend the sixth and seventh congresses of Red Cross Societies at Vienna and St. Petersburg respectively ; he was also secretary of the Central British Red Cross Society from its foundation until 1902. He wished to proceed with the forces to South Africa, but he could not be spared from the War Office.

At the termination of his War Office appointment in 1902, he went on a mission to South Africa, and the results of his investigations are given in his "Detailed Reports on Sanitary Conditions relating to proposed Cantonments and Encampments for the Troops in South Africa."

His next tour of service was in North China, and while there he was attached for two years to the Japanese forces in Manchuria during the Russo-Japanese War. Here he gained invaluable experience regarding the medical administration of large forces in war, and he published his observations in a series of educative reports in the well-known volume containing the "Medical and Sanitary Reports from officers attached to the Japanese Forces in the Field." Nearly all the papers in this volume published by the General Staff of the War Office were written by Macpherson. For his services in Japan he was awarded the Japanese War Medal, the Order of the Sacred Treasure (3rd Class) and the Meritorious Service Medal of the Japanese Red Cross Society.

On his return home he was attached to the staff of the Director of Military Operations, and in this appointment he was associated with some of the most able men in the Army, gaining himself valuable knowledge of staff duties and bringing home to the staff the importance of efficient medical arrangements in the field.

In 1910 he was appointed P.M.O. in Malta, and in 1911, largely influenced by the desire to be near his son, who was serving in a Gurkha regiment, he accepted the post of A.D.M.S. of the 4th Quetta Division, and was appointed lecturer on military medical subjects at the Staff College

there from 1911 to 1914. Quetta then became a centre in which medical officers were desirous of serving in order to obtain the advantage of Macpherson's teaching.

Early in 1914 Sir Arthur Sloggett, then D.M.S. India, was appointed Director-General, Army Medical Service, and took Macpherson home with him as his Deputy Director-General. It was fortunate for the Corps that this selection had been made, for, on the outbreak of war, much of the administrative work naturally fell on Macpherson's shoulders. His previous experience in the Russo-Japanese War, his intensive study of military medical matters, and his intimate knowledge of Red Cross organization, enabled him to grapple with the many problems which had to be settled in those breathless early days of war. When for a short time Sir Arthur Sloggett was ill, Macpherson had to carry on the duties of D.G. as well as D.D.G. He had to bear the brunt of the first great rushes of wounded after the early battles, and had to organize hospitals and other accommodation almost within a night, and to find medical supplies on a gigantic scale within a few hours. From this fiery ordeal he emerged with the greatest credit.

When Sir Alfred Keogh relieved Sir Arthur Sloggett as Director-General, Macpherson at first took over the duties of adviser of the Indian Corps with his headquarters at Abbeville, but shortly afterwards he became D.M.S. of the 1st Army. While adviser to the Indian Corps, he had the great misfortune to lose his only son who was killed in action.

When D.M.S. of the 1st Army he had to make the medical arrangements for dealing with the casualties resulting from the fighting at Neuve Chapelle, the attack on Festubert and the battle of Loos. In arranging for the treatment of the wounded he was closely associated with some eminent members of the profession who held temporary rank at the Front; and more especially with the consulting surgeon of the 1st Army (Sir Cuthbert Wallace). At the battle of Loos arrangements were made for the first time for an advanced operating centre in support of the casualty clearing station. When trench foot appeared, Macpherson set himself energetically to stem the drain of men incapacitated from this cause from the Army and was very successful in his efforts.

From the 1st Army, Macpherson proceeded to Salonica as D.M.S. of the force. He completely reorganized the medical transport, as ordinary motor ambulances, wagons and cars were of little or no use for first line work in that country. He early realized the danger of malaria in the force and put forward a most comprehensive scheme for its prevention.

In March, 1916, he returned to France as D.D.G. M.S., at G.H.Q., 1st Echelon; an appointment he held until June, 1918, when he was obliged to retire, having reached the age limit.

It was as D.D.G. that he became so well known to all medical officers on the British front. Macpherson was the pivot on which everything turned, and the "Advisory consulting surgeon" has borne testimony to the smooth working of the D.M.S.'s office.

Macpherson had a leading part in the efforts which were made to develop surgery at the front. In the bringing of C.C.S.'s as near the front as possible, reinforcing them with surgical teams and improving their equipment he was one of the chief factors. He made strenuous efforts to increase the hospital accommodation in France so as to prevent the wholesale evacuation of slightly wounded and sick casualties to the United Kingdom.

He maintained close and friendly relations with the staff at G.H.Q. and with the commanders of armies, and in this way was enabled to estimate the number of casualties and to make arrangements before a battle for their reception and treatment.

For his services he received many honours and distinctions. Prior to the Great War, in addition to his Japanese decorations, he was made a Knight of Grace of the Order of St. John of Jerusalem in 1901, was awarded the C.M.G. in 1902, and was appointed Honorary Physician to the King in 1912. During the war he was mentioned nine times in dispatches, was made a C.B. (Military), a Commander of the Legion of Honour, a Commander of the Crown of Italy (3rd Class), and a Knight Commander of the Order of St. Michael and St. George. In 1922 he was awarded the Distinguished Service Medal of the United States of America. In July 1919, he received from the University of Edinburgh the honorary degree of LL.D., an honour he greatly appreciated.

After his retirement from the Army Macpherson's most important work was editing the "Medical History of the War," and it says much for his literary accomplishments and his organizing ability, that in the short space of three and a half years he brought out eleven volumes. This medical history, which has attained a very high reputation, was completed before similar histories of other combatant nations were well begun.

In addition to his literary work Macpherson was a member of the Committee on the expansion of the medical service in case of a national emergency from 1921 to 1923; of the Committee on the Royal Commission on the Superior Civil Services in India, 1924 to 1926; and Chairman of the Special Committee on Tests for Drunkenness, 1926-27. On numerous occasions he also represented His Majesty's Government at the Convention of Red Cross Societies at Geneva. He also acted as official reviewer for the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

Macpherson was a strict disciplinarian and very tenacious of his own opinions; but very accessible, good tempered and always open to argument. He had a very high sense of duty and there was nothing small in his nature. He was known as "Tiger Mac" in the Service, a tribute to his energy and efficiency. But under his courteous and rather official manner there was a kind and gentle disposition, which those associated with him soon learned to appreciate.

Though devoted to letters he was also keen on sport of all kinds. He was champion boxer and one of the best gymnasts of his year at Edinburgh

University. At Gibraltar he raced, hunted with the Calpe hounds, and played polo. While at Quetta his racing matches brought him one of his most valued trophies, a cup. In the Generals' competition of the Army Golf Meeting he was always a keen competitor, and no one was more pleased than he when the R.A.M.C. won the Army Championship Cup at St. Andrews in 1925.

He married, first Miss E. A. Clurras, daughter of Mr. J. Clurras, of New Orleans; she died in 1907. In 1910 he married Geraldine, youngest daughter of General Sir John Doran, K.C.B., of Ely House, Wexford.

The funeral service was held in the Holy Trinity Church, Brompton, on October 19, and many senior officers attended. A memorial service was also held in the chapel of the Queen Alexandra Military Hospital, Millbank, on October 25th.



## Original Communications.

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### DUTIES OF AN EMBARKATION MEDICAL OFFICER.

BY MAJOR G. F. RUDKIN, D.S.O.  
*Royal Army Medical Corps.*

FOR the purpose of these notes, the duties of an Embarkation Medical Officer may be described under the following headings:—

- A.—The inspection of hired transports and freightships.
- B.—The medical equipment of troopships and freightships.
- C.—The embarkation of troops and families for abroad.
- D.—The disembarkation of invalids and “sick transfers.”

#### A.—INSPECTION OF TRANSPORTS AND FREIGHTSHIPS.

Para. 1081, King's Regulations, gives a definition of these two types of ships conveying troops, etc.

##### *Transports.*

*First Inspection* (King's Regulations, para. 1033):—This is an inspection usually carried out on the day previous to embarkation of the troops, to see that the fittings, sanitary conditions, and arrangements for the accommodation, preservation of health and messing of the troops, etc., are satisfactory, and that the ship is clean in every way and fit for the embarkation.

The Board is composed of the following representatives: Principal Sea Transport Officer (Board of Trade Representative); Embarkation Commandant; Embarkation Medical Officer.

The Officer Commanding Troops and the Senior Medical Officer proceeding on the transport (and a Veterinary Officer, if horses are to be embarked) also attend this inspection.

The E.M.O. should have a knowledge of the “Specification for the Fitting of Transports” (Appendix IX, Regulations for His Majesty's Sea Transport Service, 1927).

At this inspection the E.M.O. should call attention to any defects in the arrangements which he may note and take steps with the Board of Trade representative, shipping company representative and the person whom the defects may concern, to have the necessary alterations or improvements made before the troops embark. He should see samples of the food for the messing of troops and families, and pay special attention to the “fresh milk” which is being carried.

The Board at the completion of this inspection make a report as to whether the arrangements are satisfactory and the report is signed by the

members and also the O.C. troops, and S.M.O., who have attended the inspection.

It is the duty of the E.M.O. to ascertain whether the crew are free from infectious disease and he should inspect the crew and their quarters. He should do these inspections in conjunction with the ship's surgeon.

*Medical Personnel and Equipment.*—When inspecting ships before troops embark, the E.M.O. will satisfy himself that a sufficient number of officers and soldiers of the R.A.M.C. have been detailed, that the necessary equipment and supplies have been put on board, and that the medical arrangements generally are satisfactory (para. 560, Regs. M.S.A.).

*Freightships.*—The first inspection of a freightship is usually carried out immediately previous to embarkation, i.e., on the day of sailing and not the previous day. The "Specification for the Fitting of Freightships," Appendix X, Regulations for His Majesty's Sea Transport Service, 1927, should be studied by the E.M.O.

*Final Inspection.*—The Composition of the Board is the same as at the first inspection, and the O.C. troops and S.M.O. accompany the Board at this inspection and sign the report. The inspection is carried out after all the troops and families have embarked, and the troops should be seated at their mess tables, on the troop decks. It is made chiefly to ascertain whether the arrangements for the berthing of the troops, stowing of baggage, etc., have been carried out.

## B.—MEDICAL EQUIPMENT.

### (1) *Embarkation.*

(a) When the ship's surgeon is in medical charge for the voyage military medical equipment is NOT embarked.

(b) When a medical officer of the R.A.M.C. is appointed Officer in Medical Charge during the voyage, the medical equipment in accordance with Regulations for the Medical Services of the Army, Appendix 31, Scale A or B, is placed on board, with the addition of Scale D when women and children are embarked.

Care should be taken that all sera and vaccines are obtained fresh from the R. A. M. College and calf lymph from the Government Lymph Establishment, just prior to sailing. These should be placed in cold storage on the ship.

The E.M.O. should obtain the receipt for this medical equipment from the S.M.O. of the ship on a duplicate copy of the voucher Army Form I. 1209, supplied by the Army medical store issuing the medical equipment. One copy of this voucher the S.M.O. retains to support his ledger (Army Book 40) and the other copy, receipted, the E.M.O. should return to the Army medical store.



*(2) Disembarkation.*

At the termination of the final voyage, the medical equipment of a transport or freightship will be dealt with in accordance with Regulations for the Medical Services of the Army, paras. 356 and 357. When, as it sometimes happens, a freightship is alongside only for short time, the medical equipment should be packed and removed immediately to the nearest Army medical store, where it is checked and necessary adjustments made by correspondence with the S.M.O. of the ship afterwards.

The ledger (Army Book 40) is disposed of in accordance with para. 359, Regulations for the Medical Services of the Army.

C.—DUTIES IN CONNEXION WITH EMBARKATION OF TROOPS  
AND FAMILIES.

*On a Transport* all families and unattached officers who are not arriving with troops, embark on the day previous to sailing. Troops and attached officers embark on the second day (day of sailing).

*On a Freightship* it is usual for all persons to embark on the day of sailing. On arrival at the berth all families and officers have to report to the Embarkation Staff Office to obtain their berthing tickets, etc. Officers have to sign the arrival report book.

The E.M.O. should post an orderly at this reporting office to collect the Army Forms B. 155 (in duplicate), which should be in possession of every family reporting.

The contents of King's Regulations, paras. 1097 (c) and 1147, both as amended by Army Order 24 of 1927, should be known by the E.M.O. The certificates of fitness of families should be brought in duplicate and also show the date that the lady and children were last inoculated and vaccinated. These Army Forms B. 155 must be collected and checked, and it is the duty of the E.M.O. to hand one copy of each to the S.M.O. (or ship's surgeon if no military medical officer) at the completion of the embarkation. The S.M.O. in due course compiles his inoculation and vaccination state with the aid of these forms. In the event of a family not being in possession of the necessary certificate of fitness they must be passed by the E.M.O. before being permitted to embark.

*Inoculation State of Unit, Draft or Individual, A.F. I. 3956.*—Each unit, draft or individual proceeding overseas should be in possession of this form together with nominal rolls of all unprotected persons. The unit or draft proceeding overseas sends one copy to the War Office (A.M.D. 6), and one copy to the D.D.M.S. of the command concerned. Another copy of the completed form with rolls of unprotected officers, other ranks, women and children, is taken by the unit, and handed to the staff officer in charge on the day of embarkation. These forms should be collected by the E.M.O. and handed to the S.M.O. for his information.

A.C.I. 396, dated August, 1926, as amended by A.C.I. 25 of 1927, states

that a nominal roll of all officers who have not previously served abroad will be given to the S.M.O. of the ship so that he may give special attention to the question of their inoculation against enteric (if not previously done). The best way of finding out those who have not previously served abroad is by permission of the Embarkation Commandant to add a column to the Officers' Arrival Report Book (previously referred to) headed "Whether or not previously served abroad," for each officer to answer when signing his name. After all officers have reported on the second day of embarkation a nominal roll of those who have answered "No" should be compiled and handed to the S.M.O. and the purport of the A.C.I. explained.

*List of Instructions and Pamphlets which should be given by the E.M.O. to the S.M.O.*

(1) Pamphlet entitled "Notes for the Guidance of Officers in Medical Charge of Hired Transports."

(2) Pamphlet entitled "Notes and Instructions for Officers Commanding Troops on Transports from Great Britain to India, Officers travelling on Transports and Draft Conducting Officers."

(3) Leaflets entitled "Prevention of Influenza."

(4) List of returns required by E.M.O. on arrival at Southampton.

(5) Form "L" to be completed and handed to the E.M.O. at port of disembarkation.

(6) Letter prohibiting drugs being obtained in Egypt, except in cases of emergency.

(7) Letter *re* contacts of infectious diseases.

(8) Letter *re* patients wearing hospital clothing on board.

(9) Letter *re* diets, extras and medical comforts.

(10) Pamphlet entitled "Health Memorandum for Troops."

(11) Pamphlets entitled "Notes and Instructions for the preservation of health of Women and Children proceeding to India and other tropical countries."

(12) Voucher (A.F. G. 1033) for stationery, Army forms and Army books placed on board.

Regulations for the Medical Services of the Army, Appendix 32 (amended by A.O. 408, of 1926) give a list of forms and books to be put on board a transport for the use of the S.M.O. It is the duty of the E.M.O. to provide these together with sufficient stationery.

In the case of a freightship all these forms and books are not necessary, and the E.M.O. should put on board only those which will be required, the number and quantity depending on the number of troops and families embarked, and whether a military medical officer or ship's surgeon is to be in medical charge.

The Army forms, books and stationery should be detailed on a voucher (in duplicate) and a receipt obtained by the E.M.O. If the ship's surgeon

is to be in medical charge it is necessary to make a list of the Army forms and append a short explanation of their use opposite each item (Regs. M.S.A., para. 563).

*Venereal Cases.*—All cases of venereal disease who may be passed fit for service abroad will be embarked as "transfers" (Regs. M.S.A., para. 561). Units should bring nominal rolls of such cases, which are brought to the notice of the E.M.O., who hands them over to the S.M.O. of the ship.

#### D.—DUTIES IN CONNEXION WITH DISEMBARKATION.

Southampton, Liverpool, London—Tilbury, London—R.A. Dock, and Plymouth are the more usual ports at which troops and invalids are disembarked.

In peace the regular transports all use Southampton as their port.

Freightships may use any of these ports.

Regulations for the Medical Services of the Army, para. 549, state that, "In the event of hospital ships, ambulance transports, or hired transports arriving at or departing from any port other than Southampton, the Embarkation Medical Officer, Southampton, will either dispatch a portion of his staff to deal with medical embarkation matters, or arrange with the Deputy Director of Medical Services of the Command in which the port is situated, to detail an officer and the necessary staff to act on his behalf," and it is as an aid to the officer detailed to act as E.M.O. that these few notes were primarily compiled.

The following is the usual routine carried out by the E.M.O. for the disembarkation of invalids, sick transfers, etc., from transports or freightships in Great Britain.

*Prior to the Arrival of the Ship in Port.*—Nominal rolls on Army Form B. 254 from the D.D.'s M.S. of commands abroad, other than India, showing the invalids (and diseases) about to be embarked on each ship are posted home by a previous mail boat, and they are in due course received by the E.M.O.

A wireless message from Gibraltar in the case of ships from the East, giving the number of officers, other ranks, women and children, mental cases, and the number of "sitting" and "lying" of each, also information about infectious diseases, if any on board, is sent by the S.M.O. of the ship. This radio is usually received about three days' before the arrival of the ship.

From the information thus obtained the E.M.O. must decide the number of railway W.D. ambulance coaches (for lying cases), ordinary coaches (for sitting cases) or motor ambulances he will require for transport of these cases to their destination.

The present W.D. ambulance coaches carry twelve lying cases, an ordinary railway corridor coach at six per compartment carries forty-eight sitting cases.

Five W.D. ambulance coaches are parked at Netley Hospital siding.

The train personnel for these, food for the invalids and the train equipment is provided by the Officer Commanding, Royal Victoria Hospital, Netley. Application for them, when required for ports other than Southampton, is made to the Embarkation Medical Officer, The Docks, Southampton, who arranges the composition of the train after being informed the number and variety of invalids to be conveyed. He also arranges with the railway company concerned the time of their dispatch from Netley to ensure their arrival at the port in time to meet the incoming invalids.

The E.M.O. should give instructions for all transport that he will require for moving the invalids and sick to their destinations to be at the docks alongside the ship if possible when the ship comes in. This is necessary, as when the transport or freightship arrives the authorities always want everyone ashore and the ship cleared as soon as possible, especially at Liverpool landing stage.

*On Arrival of Ship.*—The E.M.O. should keep in touch with the shipping company concerned in the case of freightships and find out from them the expected time of arrival in port. This often differs by a large margin from the original official time and date. He must also ascertain the dock and berth to which the ship is being brought. He must be at the dock to meet the ship immediately it arrives. If he is not there the whole disembarkation of troops and families may be hung up in the event of there being a case of infectious disease on board. It is usual for the port health medical officer to meet the ship on arrival unless he happens to have boarded the ship "down the river" previously. The E.M.O. should get in touch with him and interview the S.M.O. (or ship's surgeon if no military M.O. in charge) and find out if there have been, or are, any infectious disease cases on board.

The port M.O. gives "pratique" to the ship and permission for others to come aboard, for passengers to disembark and issues instructions in the event of there being infectious diseases on the ship.

The S.M.O. of the ship should meet the E.M.O. (and port M.O.) at the gangway when they first go on board. The S.M.O. should have Form "L" completed, giving numbers, etc., of invalids and sick for disposal. The E.M.O. should find out from him if there are any special or unusual cases, the disposal of which may be doubtful.

The E.M.O. should previously make himself acquainted with the paragraphs in Allowance Regulations, which govern the issue of railway warrants to invalided officers and families, women and children of other ranks, etc. These regulations are difficult to follow, and for that reason the question of issue of such railway warrants is mentioned in connection with each class of individual. The E.M.O. does not usually issue the actual warrant, but should give the invalid concerned a note to hand to the Embarkation Staff Officer when he or she applies for a free railway warrant. It is advisable to have a variety of these notes typed out beforehand.

*Interview and Evacuation of Invalids.*—Having met the S.M.O. (or ship's surgeon), and found from him what invalids, and sick, etc., are on board, the E.M.O. should then arrange to see all these, other than "other ranks" (all of whom will be sent to R.V. Hospital, Netley).

These invalids can be seen in any convenient part of the ship; either the first saloon or smoke room is suggested.

Collect their invaliding documents and see each person individually and decide their disposal. Give them their instructions and a note to A.E.S.O. for free railway warrant if they are to be allowed to go home, and if they are entitled to free railway warrant by Allowance Regulations.

The following are examples of such cases and their possible disposal, but each case has to be judged individually and subsequent disposal decided:—

*Invalided Officers.*—If recommended by a medical board for change to Great Britain or leave, and the officer is fit to travel to his home, and does not require immediate hospital treatment, tell him to proceed to his home, and to report his arrival in Great Britain to the War Office or to the India Office (Indian Army Officers).

Take his home address. Send his address and invaliding documents to the War Office, or India Office, as the case may be.

*Invalided Officer unfit to travel.*—If unfit to travel, arrange for him to be put on the train for Netley, or arrange for his transport to other hospital. His invaliding documents should accompany him to hospital. The E.M.O. should instruct his R.A.M.C. baggage orderly to obtain a list of kit in the hold, from the officer, collect it and in due course arrange for its disposal in accordance with the officer's wishes—probably to be handed to an agent.

Occasionally special instructions are received by the E.M.O. for certain cases of invalid officers to be sent direct (if fit to travel) to Queen Alexandra's Hospital, Millbank, or other special hospital (Sister Agnes Hospital), in which case the officer is given a note to A.E.S.O. for a railway warrant to which he is entitled under Allowance Regulations, para. 265 (d).

Arrange the transport of the officer by train or motor ambulance, and if he requires meeting at the railway station in London, telephone or telegraph to Officer Commanding, Queen Alexandra Military Hospital, Grosvenor Road, S.W. 1, for the necessary transport to meet him, saying time of expected arrival.

Invalided officers of the British Army are *not* entitled to the issue of free railway warrants to their homes except those officers who are invalided in *consequence of active service* (Allowance Regs., para. 260).

Officers and families of officers of the Indian Army who are invalided are *not* entitled in any circumstances to the issue of travelling expenses.

Families of invalided officers (British Army) are entitled to issue of railway warrants to selected place of residence when (and *only* when) the

wife has been recommended by the Medical Board to accompany the invalided husband *as an attendant* (Allowance Regs., paras. 281 (b) and 389 (d), and Army Order 476 of 1924), but the invalided officer is *not* entitled to a railway warrant unless he is invalided as a result of active service.

*Invalided Wives and Children of Officers.*—These invalids are not entitled to treatment in a military hospital, and if they are unfit to travel to their homes or elsewhere, arrangements must be made for their admission to a private nursing home or other private hospital.

It is usual for a wireless request in such cases to be sent to the E.M.O. asking for nursing home or other accommodation to be arranged.

The invalided family of an officer of the British Army is entitled to the issue of railway warrant to the selected place of residence. The officer, if accompanying his invalided family, is *not* so entitled (Allowance Regs., para. 281 (b)).

The home address of the invalided family must be taken and this must be sent with invaliding documents to the War Office or India Office as the case may be.

*Invalided Warrant Officers (Indian Army).*—These W.O.'s are sometimes invalided home and recommended for leave in Great Britain, in which case, if fit to travel and not requiring hospital treatment, they should be treated in the same way as Indian Army Officers, e.g., home addresses taken and documents sent to the India Office.

They are *NOT* entitled to railway warrant to selected place of residence. They should be instructed by the E.M.O. to report in writing to the India Office. If they are unfit to proceed on leave and require hospital treatment, they should be sent to the Royal Victoria Hospital, Netley.

*Invalided Other Ranks.*—These are all sent to the Royal Victoria Hospital, Netley (King's Regs., para. 1232 (ii) and Army Order 19 of 1925).

*Families of Invalided Other Ranks.*—Families of invalided other ranks *will* be sent to Netley (King's Regs., para. 1232 (ii)). In this connexion it should be noted that accommodation in quarters at Netley for the families of invalided other ranks is limited; at present only eight quarters are available, which in the trooping season are soon filled and not rapidly vacated.

To avoid overcrowding and possible disappointment on arrival at Netley, it is suggested that the husbands and wives be interviewed by the E.M.O., the situation explained to them, and if the family has a home to which they would prefer to go to direct, let them do so. Issue them with a note for a railway warrant as an "unaccompanied family." The husband cannot be given leave to accompany them home but must be sent to Netley, and in accordance with the King's Regulations, paragraph 1232, the family is entitled to quarters at Netley if they wish to go there.

*Invalided Families of Other Ranks.*—These must also be seen separately by the E.M.O., and their invaliding documents perused. Cases which do

not require immediate hospital treatment and are fit to travel, should be instructed to proceed to their place of residence, or if no home is available, and if accompanied by their husbands, they should be allowed to proceed with them to the regimental depots or stations to which they are ordered to report.

King's Regulations, paragraph 1232 (vii), states that "soldiers with invalided wives will accompany them to their destination," and the husband is given seventy-two hours leave for this purpose by the Embarkation Commandant on receipt of the necessary note from the E.M.O. The address to which the family is proceeding must be taken by the E.M.O., and this together with the invaliding documents sent to the Officer in charge of Records of the unit concerned.

These families are all entitled to free railway warrant to destination, and a note to A.E.S.O., should be given (Allowance Regs., para. 212).

If the invalided wife or child of a soldier is too ill or unfit to proceed home, she or the child should be sent to a Military Families Hospital. These cases disembarked at Southampton are sent to the Military Families Division of the Royal Victoria Hospital, Netley, and cases disembarked at London are sent to the Military Families Hospital, Woolwich, S.E. 18. Any cases disembarked at Liverpool are sent to a civil hospital.

The husband and other members of the family should accompany the invalid and arrangements should be made for provision of quarters for them. If the invalid is sent to a military hospital, the documents should be sent to the officer commanding the hospital concerned.

*Members of the Q.A.I.M.N.S.* invalided from abroad who are recommended for treatment will be sent direct to the Queen Alexandra Military Hospital, S.W. 1 (King's Regs. para. 1232 (iii)). The E.M.O. should arrange the necessary transport for them and notify the O.C., Q.A.M. Hospital, the time of arrival. They are entitled to free railway warrant. Invaliding documents to be forwarded to O.C., Q.A.M. Hospital, S.W. 1.

If not requiring immediate hospital treatment, and are fit to proceed home, allow any such cases to proceed on leave, and instruct them to report their arrival in writing to the War Office (A.M.D. 4). No railway warrant is admissible. Take home addresses and forward them together with invaliding documents to A.M.D. 2, War Office, S.W. 1.

*Mental cases, officers and other ranks* will all be sent to the Royal Victoria Hospital, Netley. A guard for such cases must be provided. The composition of the guard must be arranged by the E.M.O., according to the number and severity of the cases, and may be a R.A.M.C. guard or regimental guard provided by personnel from units ex the ship.

In all cases a senior N.C.O. must be put in charge and definite orders given him as to his duties. The R.A.M.C. officer detailed to accompany the invalids to Netley must take over the valuables and dangerous articles of the mental patients from the S.M.O., and hand them over to the officer commanding, Royal Victoria Hospital, Netley, on arrival and obtain the necessary receipt.

*Mental Wives or Children of Officers and Other Ranks.*—Arrangements must be made for all such cases to be sent to a private institution, or for them to be handed over to the care of relations or friends. *Mental wives or children of other ranks*, will not be sent to Netley (King's Regs., para. 1232 (v).), or to any military station. If they have no homes to be sent to or friends to take charge of them, they will be handed over to the authorities of their own parish. Pending arrangements for this purpose, the G.O.C. at the port of disembarkation will make local arrangements for their safety.

The above is quoted from King's Regulations.

In practice the following is the usual procedure.

If the husband or friends are willing and capable of taking charge of the patient they may be allowed to do so by the E.M.O., who must get the responsible person to sign the certificate contained in Regulations for the Medical Services of the Army, Appendix XIX.

The E.M.O. must take the address to which the invalid is proceeding and forward it together with the invaliding documents to the Record Office of the unit concerned in the case of other ranks families—the War Office or India Office respectively in the case of an officer's wife or child.

Issue the invalid and the husband (if accompanying) but *not* the friends with a note to the Embarkation Staff Officer for a railway warrant to destination, and hand the case over after obtaining the certificate referred to. If the case is not a suitable one for handing over to relations or friends, the E.M.O. must get in touch with the local relieving officer and arrange for the case to be received in the local Parish Asylum, W.D. conveyance, or railway warrants, being provided.

It may be necessary for the case to be "*certified*" before acceptance by the asylum and the necessary forms have to be completed by the medical officer who has been in charge of the case during the voyage. The institution receiving the patient will provide the necessary forms for completion, but Regulations for the Medical Services of the Army give a copy of the certificate for use if required (Appendix XVIII).

*Sick Transfers, Other Ranks, i.e., Men falling sick on the voyage.*—Men becoming sick on the voyage are not necessarily sent with the invalids to Netley, but may be transferred to the nearest military hospital, if still requiring treatment. Army Book 172 (extract) must be completed to accompany each patient to hospital.

*Invalids for Netley.*—Having settled the various destinations of the invalids, the E.M.O. should superintend the disembarkation of the patients for Netley and the loading of the special train, if such is being employed. If the invalids are few in number and sufficiently convalescent to travel by ordinary train to Netley, they should be placed in the charge of a R.A.M.C. N.C.O. to conduct them, and the necessary railway warrant issued for the journey.

In case of, say, one or two seriously ill lying cases arriving at ports other than Southampton, and the total invalids not justifying the use of



an ambulance coach, the E.M.O. should arrange for these few cases unfit to travel to be transferred to the nearest military hospital (the other cases being sent to Netley), and report the fact to the D.D.M.S. of the command in which the port and military hospital involved are situated.

A medical officer will be detailed by the S.M.O. of the transport or freightship to accompany the invalids to Netley if numbers, etc., make it necessary.

This officer will be in charge of the invalids and will hand over all documents of invalids, and all valuables, etc., of mental cases to the Officer Commanding, Royal Victoria Hospital, Netley.

*Venereal Cases.*—These, except invalids, will proceed with their units if fit to do so. Army Forms I. 1239, I. 1247, and extract Army Book 172, must be sent by the E.M.O. to the unit concerned, to pass to the M.O. of the station.

*R.A.F. Invalids.*—It is customary for the military E.M.O. to arrange the disposal of these invalids.

Those cases convalescent and fit to travel should be sent to the Royal Air Force Central Hospital, Halton, Bucks (nearest station Wendover).

Lying cases and those unfit to travel in ordinary train to Wendover, should be dealt with in the same way as Army other ranks.

The E.M.O. should report to the R.A.F. Embarkation Officer (if one is present) the numbers to be disposed of. The necessary railway warrants will be provided by the R.A.F. Embarkation Officer, but if such officer is not present they will be issued by the military authorities, and endorsed in red ink "Chargeable to the Air Ministry."

When patients are sent to Halton, the O.C., R.A.F. Hospital, there will be notified the time they are due at Wendover, Bucks.

*Naval Invalids.*—The Admiralty makes arrangements for the disposal of these.

*Notification of Dispatch of Invalids to Netley.*—When the invalids have been dispatched to Netley, the E.M.O. should telephone or telegraph the numbers which have been sent and the expected time of arrival at Netley. A nominal roll of all invalids and sick transfers sent to Netley must accompany them.

*Infectious Disease Cases.*—In the event of mild infectious disease, such as measles, rubella, chicken-pox, etc., being amongst the troops or families, the case must be sent to an infectious disease hospital, and it is usual to arrange with the port health medical officer for the case to go to the local civil infectious hospital. A nominal roll with the addresses of all contacts must be obtained by the E.M.O. from the S.M.O., and he must arrange for their disposal. In the event of contacts proceeding to a military station, the E.M.O. must notify by telegram to their units that they are contacts. If the "contacts" are proceeding to their home addresses and not to a military station, it is usual for the Port Health Authorities to notify the civil medical officers of health to the districts concerned. The E.M.O.

must carry out the disinfection of the ship (Regs. for the Medical Services of the Army, para. 440 as amended by A.O. 334/27) and give a certificate to that effect to the port health medical officer.

Should small-pox, or other of the more serious infectious notifiable diseases, occur on board ship the instructions contained in King's Regulations, paragraphs 1203 and 1204, must be carried out.

Regulations for the Medical Services of the Army, Appendix III, gives the measures adopted at ports against cholera, yellow fever, plague, typhus and relapsing fever.

It is a usual occurrence for any of the more common notifiable infectious diseases to occur on a troopship, and they are the cause of much work to the E.M.O. and his staff. It must be remembered that the disposal of all cases and contacts, and, in the case of small-pox and other serious infectious diseases, of all passengers, is largely in the hands of the port health medical officer, and it is advisable for the E.M.O. to keep in close liaison with that medical officer.

At the same time the E.M.O. has to carry out the various military regulations in connexion with infectious diseases. The port medical officer visits the ship immediately on arrival or prior to arrival in port, and he decides the disposal of the infectious cases and contacts, and in the event of the more serious cases, such as small-pox, of all the passengers in the ship.

Take, for example, a case of small-pox being present on a troopship on arrival in port. The S.M.O. will have presumably complied with paragraph 1203, King's Regulations, and notified the War Office (A.M.D.5) by wireless.

The information is then passed to the E.M.O. at the port of disembarkation. The officer commanding troops should have prepared nominal rolls in duplicate of all military passengers proceeding direct to their homes, stating last date of contact and the addresses in Great Britain to which each person is proceeding. These he hands to the E.M.O., who must forward them to the War Office (A.M.D.5). These rolls should show the last date of successful vaccination. The S.M.O. should also have ready a detailed statement of the outbreak.

It is suggested that when the E.M.O. is informed by the wireless message of the existence of small-pox on board ship, he should send a radio to the O.C. troops, calling his attention to King's Regulations, paragraph 1203.

This ensures that the nominal rolls, etc., are prepared before arrival in port. Previous experience indicates that this regulation is not always complied with, and it is a difficult problem to obtain the home addresses and vaccination records of all passengers after the troopship is in dock, and at least means delaying the disembarkation for many hours.

King's Regulations, paragraph 1204, states that it is the duty of the D.D.M.S. of the command of the port of disembarkation to issue

## LIST OF DOCUMENTS AND RETURNS AND THEIR DISPOSAL.

(1) Medical documents and Board papers of invalid officers and other ranks, wives and children admitted to hospital (also regimental documents for other ranks)	To hospital concerned
(2) Medical documents and Board papers of invalids proceeding home, with address :—	
(a) Officers and wives and nursing sisters .. ..	To War Office (A.M.D. 2)
(b) Indian Army officers and wives .. ..	To Military Secretary, India Office
(c) Indian Army W.O.'s on sick leave .. ..	To Military Secretary, India Office
(d) R.A.F. officers and wives and nursing sisters ..	To Air Ministry
(e) Wives and children of British other ranks ..	To Record Office of Unit concerned
(f) Wives and children of Indian Army other ranks	To Military Secretary, India Office
(g) Palestine Gendarmerie and N.C.O.'s of Iraq Levies	To Colonial Office
(3) Return of sick (A.F. B. 182), and Army Forms I. 1220	To War Office (A.M.D. 2)
(4) Consolidated Rolls of invalids under heading "D," vide K.R. para. 1108	To Record and Pay Office of each Unit concerned
(5) R.A.M. Corps Form I (showing R.A.M.C. disembarking)	To O. i/c Records, Woking
(6) Venereal documents (surveillance) .. ..	To O.C., Depot or Unit to which soldier under surveillance proceeds

The above are the documents and returns likely to be received and disposed of, from ships arriving at ports other than Southampton.

## LIST OF RETURNS AND DOCUMENTS TO BE HANDED OVER TO THE E.M.O. ON ARRIVAL IN PORT.

<i>Nature of Return or other Document.</i>	<i>Remarks.</i>
Return of sick (A.F. B. 182) .. ..	
R.A.F. Form 38 .. ..	
Nominal roll in triplicate (A.F. A. 36) .. ..	Two for Netley and one for E.M.O., to be grouped as follows: (a) Invalid officers and sisters; (b) Officers or sisters proceeding on sick leave; (c) Invalid other ranks; (d) Sick transfers other than invalids; (e) Invalid families; (f) Husbands accompanying sick families; (g) Families accompanying sick husbands; and (h) Mental cases on separate roll
R.A.M.C. Casualties (A.F. O. 1810) .. ..	For out and home
R.A.M.C. Corps Form 1. .. ..	In duplicate for R.A.M.C. and A.D. Corps on board
R.A.M.C. Conduct and Medical History Sheets, with A.F.B. 198	For trooping party
Documents of deceased soldiers .. ..	Case sheets, invaliding documents, etc.
Requisition for stationery (M.S.) .. ..	For ensuing voyage
Indent for medical stores (A.F. I. 1209) .. ..	For ensuing voyage
Pack Store Cheques (A.F. B. 182) .. ..	For voyage
Diets Sheet (A.F. I. 1202 and 1205) .. ..	For voyage
Medical and Surgical Ledger (A.B. 40) and supporting vouchers	At end of season when permanent trooping party, otherwise, at end of voyage
Roll of baggage (M.S.) .. ..	
Roll of infectious diseases (A.F. A. 36) .. ..	
Report on cases of typhoid fever (A.F. I. 3056) .. ..	
Hospital Case Cards (A.F. I. 1220 and R.A.F. F. 39) ..	
A.F. G. 1033 .. ..	
Disembarkation State (Form L) .. ..	
Death Certificate (M.S.) .. ..	

instructions for the disposal of military personnel. The usual procedure is for troops and families who are not immediate contacts to proceed to their destinations. It is the duty of the E.M.O. to notify every unit or station to which the troops or families proceed that small-pox has occurred on the ship, giving the date of occurrence, etc. The nominal rolls with the home addresses, if military personnel, are sent to the War Office (A.M.D. 5). A copy of this nominal roll will also be asked for by the port health authorities, who then notify the medical officers of health at the places to which these persons proceed that they are contacts.

*The immediate contacts* and the R.A.M.C. orderlies who have been in charge of the case must be placed in quarantine for the necessary period (eighteen days in the case of small-pox, unless successful vaccination meanwhile proves that they are protected from the disease; see page 140, Regulations for the Medical Services of the Army), and the E.M.O. must make the necessary arrangements for this to be done.

*Disinfection of the ship* must be carried out by the E.M.O. in accordance with paragraph 440, Regulations for the Medical Services of the Army (as amended by A.O. 334/27), unless the port health authorities take charge of the disinfection, which they usually do in such cases as small-pox on a freightship.

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## THE ADMISSION AND DISCHARGE BOOK ON ACTIVE SERVICE.

BY MAJOR R. H. CORDNER.

*Royal Army Medical Corps.*

DURING times of peace the Admission and Discharge book does not obtrude itself to any extent on the notice of medical officers. As a rule only a few dozen patients are admitted or discharged during the day. There is a set routine for this purpose and all is plain sailing. On the outbreak of war the state of affairs in the forward medical units is very different. Instead of dozens, hundreds of wounded pour into casualty clearing stations and field ambulances; evacuations take place when and as they can be arranged. Admissions and discharges may take place simultaneously, and may take place in darkness to screen the movement from hostile aircraft. It is evident that a system must be devised which will reduce nominal rolls or reports from M.O.'s, sisters in charge of wards, or orderlies, to a minimum. In fact what is required is some foolproof system which will allow an N.C.O. and party to go round the wards and collect all cases for evacuation, know how to distinguish lying down, sitting, medical, surgical or infectious cases, and convey them to the train or ambulance convoy, without needing to ask questions or consult nominal rolls, etc.

Such a problem had to be, and was solved, by officers commanding the various medical units at the front, with more or less success.

The objects aimed at should be: (a) Simplicity, (b) rapidity, (c) minimum of writing.

As the patients are passed along rapidly, through reception rooms, operating theatre, wards, etc., each must carry on his person sufficient information to enable all coming in contact with him to know whether he is a lying or walking case, which section he belongs to—surgical, medical, or infectious—and whether he is or is not for evacuation.

At the same time all this information should be conveyed without writing. There is no time to write, and possibly it is too dark to read.

All this information can be given by prepared luggage labels. Labels are coloured all red or half red for lying down, or walking wounded. All blue or half blue for lying down, or walking sick; and yellow for infectious. Next a certain proportion of these stained labels are divided diagonally. The triangular label resulting is for patients "not to be evacuated." Now a patient with one of these labels attached will, at a glance, give the following information to the N.C.O. or orderly with an evacuation or reception party: (a) Whether he is to be moved lying or walking; (b) what section of the hospital he is to go to; (c) if for evacuation.

The case given a triangular "not to be evacuated" label in the reception room will find his way to the particular section of the casualty clearing station indicated on the label. Here he will remain and be treated until a M.O. decides that he is fit for evacuation, and changes his triangular label for a whole one. The moment this is done, he is a marked man for the attentions of the evacuation party, and he will be passed along to the railway platform or convoy.

There is still one more problem to be solved. How is the office to complete the Admission and Discharge book and casualty report A.36? The latter report requires the names to be submitted according to regiments, and the former, to allow ease of reference, should be alphabetically arranged.

The reception room of a casualty clearing station or field ambulance is working at one time quietly, at another at the highest pressure, and it will be necessary at one time to have only one clerk at work, while at another five or six will not be too many. Each clerk and his table must be absolutely independent of another to prevent any possible reduplication of numbers, and to allow any clerk or clerks to be added or removed, as the pressure of admission increases or diminishes. To meet these demands the following method was adopted. The reception room was furnished with five reception tables marked A to E. Each table was supplied with a number of casualty card envelopes, A.F. W. 3118A, each containing a plain white card. (These cards were obtained without difficulty from the Red Cross. In an emergency, luggage labels will do, but they do not "file" so well and are not as easy to handle as a stiff card.) To the envelope a two-inch slip of paper is gummed for half an inch of its length, and the card placed in the mouth of the envelope. For the sake of clearness I will refer to this card in future as the reception card. Both the slip attached to the envelope, W. 3118A, and the reception card are inscribed with a cypher letter and serial number. The first is the distinguishing letter of the table from which it is issued, followed by a serial number. At the moment of issue the first letter of the patient's surname is added to the serial number on both the reception card and envelope.

The reason for this apparently complicated method is to reduce the size of the number, and fix responsibility for inaccuracy or careless writing. The initial of the surname will be seen later to be necessary when filling in the Admission and Discharge book and filing the card. On the arrival of a patient, the clerk picks up one of the prepared envelopes and cards (N.B.—It is not necessary to pick the cards in sequence; they bear merely a cypher number for the patient and are not for statistical purposes), removes the card, enters on it the patient's particulars taken from his A.F. W. 3118, stamps the latter with the number of the C.C.S., dates, and replaces it in the prepared envelope. To both the card and envelope he adds the patient's first initial. The new numbered envelope and the patient's original casualty card, A.F. W. 3118, are handed back to him, and the

reception card is placed in an alphabetical tray on the clerk's table. The reception cards are collected from time to time from all the tables, and always at 12 o'clock midnight, and taken to the office. Here a clerk copies them into the Admission and Discharge book. As each card is finished with it is passed to an orderly and arranged regimentally. (This is not as difficult as it seems, as probably only five or six units of those involved will be evacuated through any one C.C.S.) When arranged by regiments, the cards are used to write up the Daily Casualty Return A.F. A. 36 and then filed as an office copy of this return. The cypher number on the patient's reception card is copied into the Admission and Discharge book after his name, not in the column reserved for the serial number, which column must be filled in in the ordinary way.

To recapitulate, the patient has left the reception room with an identification number attached to his A.F. W. 3118A. A reception card also marked with this number and containing the patient's particulars has been passed to the office and entered in the Admission and Discharge book. All that is now required is for the attached slip with number to be taken from the patient on his departure from the C.C.S. and passed to the office to show he has left for the base, when the Admission and Discharge book can be completed.

To make all clear we will follow the progress of a patient from the moment of his arrival at the reception room until he is passed into an ambulance train. No. X, Private T. Atkins, is the first patient to arrive at the C.C.S. with, we will say, a G.S.W. left arm fracture. He is carried to Table A. The clerk removes his A.F. W. 3118A, writes down his particulars on a reception card, adds the first letter of his surname to both the cypher on the slip attached to the envelope and card. Placing the patients' W. 3118 in the numbered envelope, he returns it to him and puts the card in the alphabetical tray. Private T. Atkins now passes on as A.1.A. He arrives before the receiving medical officer, who decides that he must be operated upon. He attaches a triangular all red label to his tunic and on he goes, now marked A.1.A. surgical, lying, not for evacuation. He is taken to a ward and awaits his turn to enter the operation theatre. Here his arm is amputated, and he is not considered fit to travel, so his label remains unaltered. A few days later, the medical officer considers him fit to go. He is given an "all red" label. He is now marked for all to see A.1.A. surgical, lying, evacuation. An ambulance train arrives, stretcher-bearers visit the wards and collect all patients labelled with evacuation cards. A.1.A. arrives at the evacuation shed and waits his turn to be entrained. As he passes the barrier on his way to the train an orderly, armed with a large bag (a Red Cross treasure bag is excellent for the purpose), removes the numbered slip from his envelope and puts it in the bag. On the departure of the train the bag, now full of slips, is closed, a label attached giving date, hour of departure, and number of the ambulance train, and sent to the office. Here it is opened and the slip

A.1.A. once more comes to light. The clerk runs his finger up the A's until he arrives at Atkins, verifies the number and fills in the disposal column with the date, hour and number of the ambulance train. From beginning to end of the patient's stay in the hospital there was only need to write the patient's name once in the reception room and twice in the office, viz., once in the Admission and Discharge book and once on the Casualty Return A 36.

From time to time the office requires information regarding empty beds and numbers for evacuation. Any orderly can periodically walk round the ward, note the numbers of evacuation and non-evacuation cards and chalk up the required figures outside the ward. The office send round a clerk with a slip of paper to jot down the figures and keep the O.C. supplied with this most necessary information.

The above method stood the test of active service. It seems foolproof, and writing and reports are reduced to an absolute minimum. While not put forward as a perfect solution of the difficulties to be met with, it may help officers commanding units to make up their own systems on some future occasion.

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## CAPTURE AND RELEASE OF TWO AIRMEN IN KURDISTAN IN 1926.

BY CAPTAIN F. R. S. SHAW, M.C.

*Royal Army Medical Corps.*

ON June 14, 1926, during some operations in Southern Kurdistan against the notorious rebel, Sheikh Mahmud, a D.H.9A aeroplane, pilot F/O F. M. Denny, passenger A.C.1. Hirst, was forced to land behind the enemy's lines on the Penjwin plain. The other machine on the reconnaissance flew round and round for a considerable time in the hope that F/O Denny would be able to get away again. However, it was not to be, and the pilot was obliged to return to his base at Kirkuk and report the misfortune. No sooner had the machine disappeared from view, than the Kurds galloped up to the wrecked aeroplane and took the pilot and mechanic prisoners. They were taken to Penjwin, where Sheikh Mahmud had his headquarters. There they remained till night, when they were sent off to a village called Walajir, about fifteen miles inside Persian territory.

On the following morning a letter was received from F/O Denny by the Officer Commanding troops, saying that he and Hirst were Sheikh Mahmud's prisoners and were being well treated. He also said in the letter that Sheikh Mahmud wanted to open negotiations with the Government on the basis of his appointment as "King of Kurdistan" in exchange for the prisoners. Thus we were left speculating as to their fate, and the general impression was that they would be well cared for, but no one could quite see how their release was to be obtained.

From time to time letters were received from F/O Denny saying that both prisoners were well and asking for various things, like clothes, books, etc.

On September 13, a letter was received from Sheikh Mahmud saying that the prisoners were ill and asking for medicine for them. As the letter gave no clue to their ailments, I sent a small parcel of some dressings and a few drugs, such as quinine, calomel, Dover's powder, magnesium sulphate, etc., with written instructions as to how to use them.

At the same time a letter was sent to Sheikh Mahmud asking him if he would guarantee safe conduct to a British doctor to visit the airmen.

On September 16 a large column, which I accompanied, moved out from Sulaimania to occupy the Penjwin plain, the object being to prevent Sheikh Mahmud from taxing the Jaf nomad tribes, who were just then on their annual migration down from Persia to spend the winter in Iraq.

On September 20 a letter was received from Sheikh Mahmud to the effect that he would give a British doctor safe conduct to visit the prisoners.

By this time the column had reached the Penjwin plain, so that, luckily for me, I was the nearest doctor available.

The Air Vice-Marshal Commanding in Iraq wirelessly from Baghdad that, if willing, I could go. Accordingly, I packed a pannier full of drugs and dressings and some medical comforts and waited till the arrangements for my journey were completed.

On the morning of September 24 I left the camp on horseback at 8.30 o'clock, my kit and the pannier being carried on a mule, and my servant bearing a large white flag.

We halted about one and a half miles out, as it was arranged that we should there be met by a party of Sheikh Mahmud's men, also bearing a white flag. They were some time in plucking up courage to come out, as the Kurd is naturally treacherous and suspects everyone else of the same fault. After waiting about twenty minutes, six very wild-looking men, armed to the teeth, galloped out from behind the hills and saluted. Through the medium of my servant they explained that they were my escort, and that they had received instructions to do everything I wished.

Thus, we started off on our twenty-mile journey, two of the escort galloping from side to side across us as we went. This, they explained, was their usual custom and was intended to show their joy at my coming to visit their Sheikh. After going about half a mile, we passed through a gap in the hills where they had their picquets.

Every pathway was guarded by armed sentries, who challenged us as we came along. They were all mounted on small Kurdish ponies, and armed with either British or Turkish rifles, and literally covered with ammunition.

About two miles beyond the picquet line we came to a very large tree, underneath which were seated two men drinking tea. Here we halted and dismounted, and the shorter of the two stepped forward and, saluting smartly, introduced himself as Majid Effendi, the commander-in-chief of Sheikh Mahmud's forces. He was a good-looking, dapper little man, about five feet six inches in height, and had been a Turkish officer during the war, both in Gallipoli and Palestine. The taller man turned out to be Sabir Beg. I had heard a great deal about him, as in 1922 he and his father had murdered two British officers in cold blood. He was a very sly-looking person, with a close-cropped beard, and I should say it would be impossible for him to look anyone straight in the face.

Majid told me there were two roads to Walajir, one a very bad road through the hills, the other a good one along the plain, but longer. I chose the latter, and we set off straightway, accompanied by Majid and Sabir. A mile further on we passed their rations going up to the picquets. They were being carried on three mules, driven by a small boy, accompanied by two armed men.

Just inside the Persian boundary we came to a village called Bashmak, Majid's headquarters. The whole village, including the women, turned out to see us. We halted here for a couple of hours, while we had some tea

and the horses were watered and fed. While there, Majid sent a mounted man back to the Officer Commanding the column, saying that I was in Bashmak, and that I was well and had everything I wanted, which indeed was quite true, as they looked after me exceedingly well throughout.

About midday we left Bashmak, this time accompanied by Sabir and six horsemen only, Majid explaining to me that he had to stay behind to direct operations, but that he hoped to see me again, and that Sabir would look after me well. We had been riding along for about half an hour when we came across a perfect network of well-dug trenches. They proved to be Russian, constructed during the war by a small column which had penetrated down there in 1917. Near here we passed large flocks of sheep and goats being driven along in the direction we were going. Sabir told me these were the taxes which the Jaf tribes had paid to Sheikh Mahmud, and that they were being sent to Walajir. Later I learnt that the Jaf had always paid taxes to the Sheikh of their own free will, as they regarded him as a very holy man.

About 1.30 p.m. we halted at the village of Pir Mustapha for lunch. The village was a nice one, with rose trees and poplars growing all around it, and large vineyards on the hillside behind. It was owned by Mahmud Khan, of Meriwan, who was very hospitable and gave us a very good tiffin, consisting of hard-boiled eggs, roast mutton, bread, and fruit, with any amount of sour milk to drink.

We resumed our journey about 3 p.m., the road now taking us beside Meriwan lake, a most beautiful piece of inland water, roughly eight miles long and four miles broad. In winter it is completely frozen over and must be ideal for skating. I was told it was full of very big fish.

Soon after passing the lake we saw about a hundred horsemen approaching. They proved to be a party sent by Sheikh Mahmud to welcome me. His brother-in-law, eldest and youngest sons, and Denny and Hirst were in the party. Although I knew the latter quite well, I did not recognize them for a moment, as they had both got very thin and were, moreover, dressed in Kurdish clothes. I was glad to hear from them that they had practically recovered from a severe chill, which they caught bathing in an icy pool. After much hand-shaking and saluting, we continued our journey, and immediately half a dozen of the party gave the customary display of horsemanship by galloping from side to side in front of us.

It amused me when I saw that the gallop was led by Sabir. I rode beside Denny for the rest of the journey and he seemed to be in very good spirits, in spite of his trying experiences. He told me that they had been well treated on the whole, and that Sheikh Mahmud gave them everything they asked for in reason.

We arrived at Walajir, a very poor village with only one decent house in it, at about 5 p.m. At the entrance to the village was a guard of honour of ten men under an officer. They were drawn up in single rank and presented arms in British fashion. Having inspected them I was brought

to a small reception bower which had been specially prepared for me. The floor was covered with very nice Persian rugs and cushions to sit upon. Here I was met by Sheikh Mahmud, who expressed great delight at my visit, and said he hoped I had been well looked after on the journey. We sat down and drank many cups of tea, while the Sheikh protested his loyalty to the British Government, and at the same time made it quite clear that he did not think much of the Arabs, nor of the Iraq Government. I listened, but made no comment.

Although a special room had been prepared for me I decided to stay with Denny and Hirst for the night, as I wanted to see the conditions under which they were forced to live. Pleading fatigue from the journey, I retired there very soon.

They lived in a small house consisting of two rooms, one of which they shared with the captain of the guard and the sentry on duty, the other being occupied by the remainder of the guard. There was an open entrance and three windows without any glass in them, so that it was bitterly cold at night, Walajir being about 4,500 feet above sea level. Denny and Hirst slept on the floor with the captain of the guard beside them. They had Kurdish mattresses and blankets, which Sheikh Mahmud had given them. One miserably small lamp lighted the room at night.

I must confess I did not sleep much and was truly thankful when it was time to get up next morning. I noticed that the sentry on duty was very wide awake all night.

The first thing I did in the morning was to examine Denny and Hirst thoroughly. The guards were looking on all the time, and I knew they would be certain to tell Sheikh Mahmud everything. I found that Denny was anæmic, dreadfully thin and simply eaten alive by fleas and lice. He seemed to be "scratching" all day and night. Hirst was in the same state.

After breakfast we walked about for an hour in the sun, and at 10 o'clock I went in to Sheikh Mahmud's house to have a talk with him. The conversation was carried on through the medium of two interpreters who spoke very little and very bad English, and I regret to say we did not make much progress. Sheikh Mahmud opened the conversation by asking me if the Government had given me any powers to negotiate with him for the release of the prisoners. I replied that I had received no such instructions, that I was merely a doctor sent by the British Government to attend to the health of the prisoners, and that I wished to do what I could for them. He replied that he had always been the friend of the British Government, and that he would do anything in his power to please them. To this I replied that his best policy was to release the prisoners forthwith, as I felt sure the Government would have nothing to do with him as long as he kept the airmen prisoners. We argued for about two hours and eventually, about midday, we broke up the meeting and went outside to have some photographs taken. At 1 p.m. we had lunch together, Sheikh Mahmud inviting Denny and Hirst to partake of the meal with us.

Immediately after lunch we commenced arguing again, so I asked Denny and Hirst to go out. Fortunately, by this time, Majid Effendi had arrived, and I soon discovered that he spoke French fluently, and that he could understand my very poor efforts at that language. We were now able to dispense with the interpreters, and immediately made much more progress. Majid was a very enlightened man, and it was easy to explain to him that a great nation like Britain, which had endured the loss of hundreds of thousands of men taken prisoners during the war, was not going to change its policy to obtain the release of two, and that it was to Sheikh Mahmud's advantage to return them unconditionally.

I pointed out that the prisoners were not accustomed to living under such conditions as his detention of them entailed, and that the imprisonment was having a serious effect upon their health. I added that I feared very much for their lives, were they to be kept in Walajir during the coming winter. I impressed upon him that the winter would shortly set in and that it would then be impossible for me or any other British doctor to come to their aid. Finally, I told him that, in my opinion, the British Government would never pardon him if anything were to happen to the prisoners, and that until he released them the Government would not even reply to any of his letters.

We broke up the meeting about 4 p.m. and I went to have tea with the Turkish doctor who was there. His name was Orhan and he had been in a hospital in Constantinople during our occupation. He inquired for some three or four officers in the R.A.M.C. whom he said he had known there. Before I left he insisted on my taking as a souvenir a small bottle of "reargon," a preparation made in Czecho-Slovakia for gonorrhoea; I have not tried it.

He displayed a fair knowledge of medicine and asked me awkward questions about the health of the prisoners. I tried to persuade him that they were very ill, but I do not think he believed me.

After tea Denny and I strolled about, Hirst, not feeling strong enough, lay down to rest. Denny told me all about their life with Sheikh Mahmud, who was evidently anxious to treat them well, doubtless with the idea of getting into favour with the Government once more. At one time he offered to provide them with wives, and at another he offered to pay all expenses if Denny's father would come out from England on a visit. Needless to say, neither offer was accepted.

While we were walking about, one of the interpreters came and asked us if we would like to see their ammunition supply. Naturally, we said "Yes," and were shown two Hotchkiss guns, one Vickers gun and one German machine gun, together with about 20,000 rounds of ammunition, mostly British, with some Turkish and Russian as well. The guns were all fired in turn, and they informed me that 10,000 rounds were being sent up to the picquets that night. All this was done with the object of creating a big impression on me. It did not.

At 7 p.m. we all sat down to dinner, Sheikh Mahmud, Said Ahmed, his brother-in-law, Majid Effendi, Denny, Hirst and myself. It was a very pleasant meal and everyone was very cheerful, Denny and Hirst each having a small bottle of champagne which I had brought as "medical comforts."

After dinner Sheikh Mahmud intimated that he would like to continue our conversations, so I asked Denny and Hirst to go out. We argued for hours, going over the same old ground again and again. Eventually, about midnight, Sheikh Mahmud said that they would discuss the matter between themselves and give me their final word in the morning.

I retired to bed, but did not sleep very much. I arose early in the morning, anxious to learn if my arguments had persuaded Sheikh Mahmud to return the prisoners. At 8.30 he sent for me and told me that he promised to send them back, after an interval of ten days and before fifteen days had elapsed. He explained that he specially desired this interval as he wished to return them voluntarily and not as though he was acting under pressure from the Government, as any indication of weakness in this respect would considerably affect his prestige with his followers and the local tribes. I asked him to call Denny in and repeat his promise. He did this and at the same time Denny undertook not to talk about it.

At 9.30 I said good-bye to Sheikh Mahmud, Denny and Hirst, and rode away, accompanied by Majid and half a dozen horsemen. We followed the same road as we had come by, and once more had a pleasant meal with Mahmud Khan at Pir Mustapha. During the ride I had a long and interesting conversation with Majid, and found him most interesting, able to discuss a variety of subjects and holding broad views on most. It seems a pity that he could not make better use of his life, but he appeared to be quite happy. When we arrived at Bashmak we halted, and a letter was sent on by horseman to the Column Commander saying that I would arrive at camp about 5 p.m., accompanied by Majid. We halted for about an hour, and I confess I dropped off to sleep as I was exceedingly tired.

We commenced the final stage of the journey at 3 p.m. and reached the picquet line without incident. Here, however, was drawn up another guard of honour, this time of an officer and fifty horsemen. They looked very business-like, and as we rode on they gave a wild shout and galloped off into the hills. As we approached camp I could see the Column Commander coming out to meet us. When half a mile away we left the escort behind, and Majid and I approached alone. In accordance with Kurdish custom, he took off his revolver and handed it to me. I did not accept it, saying that I would be responsible that he did not use it. He delivered a letter from Sheikh Mahmud to the Column Commander, saying that the prisoners would be released after an interval of ten days and asking where they were to be sent.

As the Column Commander could not say definitely, it was arranged to meet again the following morning at the same place. That night a wireless

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message was sent to the A.V.M. in Baghdad giving him full details and asking him to nominate a place. He chose Khormal, where there was a British officer. The following morning we went out and gave this message to Majid, who promised that it should be carried out.

As the object of the column had been defeated by the Jaf voluntarily paying taxes to Sheikh Mahmud, we marched back towards Sulaimania the following day, arriving there three days later. Contrary to expectations, but to everyone's great delight, Denny and Hirst were delivered over safely at Khormal on October 9.

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## THE MEDICAL ORGANIZATION FOR CAVALRY.

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THE following notes were put together as an appendix to the narrative published in the September number of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 1927, describing the operations of the 10th Cavalry Brigade Combined Field Ambulance in Syria during 1918.<sup>1</sup> Like the narrative, they were written nearly nine years ago, and some of them have been rendered obsolete—firstly by the new War Establishment for a Cavalry Field Ambulance, which resembles in many respects what was here recommended; secondly by the development of motor transport, especially of six-wheeled vehicles. If, however, cavalry ever play an important rôle in the future, it will obviously be under conditions which hamper the effective use of motor transport. It has therefore been thought expedient to leave the notes in their original form.

The narrative previously published to a great extent points the moral as it goes along. The campaign was of a special, almost a unique kind, a rapid and continuous cavalry advance pushed to an extreme depth. But the campaign of 1917 provided a much more varied if less striking experience of cavalry warfare, the retreat, the raid, the reconnaissance, fighting in desert, plains and mountains, mounted and dismounted action; and out of all this a clear conception has grown up of what a cavalry field ambulance ought to be and how it can best meet its particular problems. Experience of European warfare is, of course, lacking, but history suggests that the days of traditional cavalry campaigning there are over; the future appears to lie with infantry—particularly infantry made mobile by motor transport—and machines. If, therefore, the future of cavalry is to be confined (as we hope all warfare may be) to relatively undeveloped countries, it should be possible to find some formula of a very general application to its medical problems. Doubtless very special conditions such as waterless desert must be met by a special measure such as camel transport, but that need not prevent us from inquiring what is the ideal form of cavalry field ambulance. That no such ideal has yet been reached is suggested by the above narrative, and still more by the series of provisional establishments issued one after another for the E.E.F. in 1917 and 1918. It would require a narrative of the 1917 operations fully to support all the recommendations made below, but in general these operations only reinforced the lessons of the Syrian campaign. The ideal cavalry field ambulance may be discussed under the following heads:—

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<sup>1</sup> JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, xlix, p. 161.



- (A) Personnel.
- (B) Transport.
- (C) Mounting of personnel.
- (D) Equipment.
- (E) L. of C. organization from the field ambulance to the C.C.S.

(A) PERSONNEL.

Reserving the personnel of the transport section till later and considering here only medical personnel we may discuss first:—

(1) *Organization into Sections.*—The organization in 1918 was as follows:—

(a) *Cavalry field ambulance* or mounted brigade field ambulance (War Establishment in Field Service Manual, Army Medical Service) with a total strength of 76 is divided into two equal sections (38 strong) each equipped to act independently, and each further subdivided into bearer subdivision and tent subdivision (strengths 19 each). A number of modified “provisional establishments” have been in use at various times in the E.E.F., but the variations have chiefly concerned the transport section and the mounting of the personnel; the establishment of medical personnel has been left untouched.

(b) *Cavalry brigade combined field ambulance* had an establishment brought out in 1918 when Yeomanry regiments were replaced in the E.E.F. by Indian cavalry. It has been dealt with in the introduction to the narrative which describes the history of a unit of this kind. As, however, its organization into one British and two Indian sections proved unworkable in practice, and as the lessons learnt on the campaign were much the same as those taught by the 1917 operations when the above British establishment was in use, it is proposed to simplify discussion by confining it to the latter. It would unduly cumber this paper with detail to embark on a discussion of the complicated and clumsy Indian War Establishment, and if a model can be agreed upon for a British unit, it should not be difficult to use it in the design of an Indian establishment.

Briefly it may be said that the organization imposed by the exigencies of field service runs on different lines to the published establishments. Two bearer subdivisions have never been found to operate separately, detached portions of a brigade being served by a detachment of bearers and transport proportional to its size, while one tent subdivision has always been sufficient for the needs of a brigade in the field. Nor was the distinction between British and Indian sections ever capable of maintenance. The practical organization that enforced itself was as follows:—

(a) One bearer section comprising both the bearer subdivisions and composed of 1 officer, 24 bearers, 6 wagon orderlies, 2 buglers or gallopers (total strength 33, plus the additions suggested below)

(b) One tent section identical with one of the present tent subdivisions and composed of 2 officers, 1 S.M., 1 Q.M.S., 1 nursing serjeant, 1 dispenser, 1 packstore keeper, 1 clerk, 2 cooks, 1 sanitary orderly, 8 nursing orderlies (total strength 19, plus the additions suggested below).

(2) *Alterations in Personnel.*—The above composition of a Cavalry field ambulance calls for change, therefore chiefly by the subtraction of one tent subdivision. But the following additions and a change in the establishment of officers are powerfully supported by past experience.

*Officers.*—In place of six medical officers, four R.A.M.C. officers (the O.C., one to the bearer section, two to the tent section) and one R.A.S.C. officer (acting as transport officer and quartermaster) would promote economy and not diminish efficiency.

*N.C.O.'s.*—Two R.A.M.C. serjeants, or one serjeant, and one corporal should be available for work with the bearer section.

*Privates.*—There are certain duties not recognized in the War Establishment which none the less have to be performed. Hitherto men have been found for these duties from the bearers whose strength is thus reduced; if it is to be maintained it would be better to recognize these duties on the War Establishment.

(a) Officers' batmen are included in the transport section; but in addition to these the O.C. and the officer in charge bearer section certainly require grooms mounted on second horses. These could also be R.A.S.C. men.

(b) Signallers and gallopers; four trained signallers were found to be so necessary as to be added in 1918 to the E.E.F. War Establishment. In addition two gallopers have invariably to be detached on operations, one to the A.D.M.S. and one to brigade.

(c) Quartermaster's clerk. Brigade supplies invariably ask for a man to be attached to them on operations to take over the unit's supplies.

(d) A permanent water-duty man should always travel with the water-cart.

Whether the above should be classed in War Establishment with the bearer or tent sections need not be discussed. The effect of these additions would be to make the total strength of the two medical sections 64 (5 officers, and 59 O.R.s), the additional personnel being more than compensated by the loss of one tent subdivision.

#### (B) TRANSPORT.

(1) *Horsed Ambulance Transport.*—Slow-moving transport such as horsed vehicles and camels prove of little service for evacuation on a rapid cavalry advance, since once sent back with casualties they cannot rejoin till the advance suffers a temporary check. They are, however, necessary for the *collection* of casualties (*vide* the narrative) and the present establish-

ment of six light ambulance wagons with four mules to a wagon is adequate for this. A good form of horsed ambulance transport has yet to be evolved, both the light ambulance wagon and the two-wheeled desert cart having a number of grave defects which need not be described here.

(2) *Motor Ambulance Transport*.—It is clear that only motor transport can solve the problem of cavalry evacuation, and the Ford motor ambulance car is in every way suitable, being able to travel over any country in which wheeled transport can move at all. As regards the number necessary; on the recent campaign there were allotted to each C.F.A. twenty cacolet camels and six motor ambulances, representing a carrying capacity of fifty-two lying cases. If all the transport were motor the carrying capacity could be reduced, as the superior speed would enable more cases to be evacuated in a given time. Twelve Ford motor ambulances for each F.A. is considered adequate, but there should be attached to these one Ford box-car for carrying petrol and spare parts and two motor bicycles for M.T.N.C.O.'s.

In hilly country impassable for wheels, where cavalry may have to work dismounted (Yeomanry Mounted Division, November 19-28, 1917) or in soft, sandy desert, twelve motors may have to be replaced by cacolet camels (say thirty for F.A.).

(3) *Transport of Stores*.—Alterations in the present equipment are suggested below, but as regards weight these roughly cancel out, leaving the total amount of transport required much the same. It was found by all units that G.S. wagons cannot keep touch with cavalry on a rapid advance and have to be brigaded into echelons, following up at distances more or less respectful. But the bulk of a field ambulance's stores must travel in its first line transport, and the following scale of wagons proved adequate on the recent campaign:—

5 limbered G.S. wagons with 4 mules apiece.

1 water-cart with 6 mules.

1 travelling cooker with 4 mules.

4 pack mules (2 for water, 2 for stores).

All these travel with the ambulance as first line transport. The pack transport is to equip an advanced dressing station (manned as regards personnel by bearers) and four panniers are necessary for the stores, four fanatis or pakhals for the water. It may be remarked that the German seven-gallon dixie, combining as it does the advantage of a fantassi, cooking vessel, and stove, is far superior for this purpose to anything issued by British Ordnance. In addition to the above, two G.S. wagons, each with five mules (harnessed as in Australian transport) are required as second line transport to carry stores such as the forge, farrier's, saddler's and wheeler's tools, baggage, extra tents, etc.

Mules are far superior to horses for field ambulance work, and the transport suggested would mean an establishment of 74 mules (including 6 spare and 4 pack mules).

Transport personnel would work out at 1 serjeant, 1 corporal, 1 saddler, 1 wheeler, 1 farrier, 1 shoeing smith, 35 drivers, H.T. (including 2 for spare animals and 2 spare), 5 officers' batmen, 2 officers' grooms.

M.T. personnel work out at 1 serjeant, 1 corporal, 14 drivers (including 1 spare). Total strength of transport section (exclusive of R.A.S.C. officer) 64 other ranks.

### (C) MOUNTING OF PERSONNEL.

The lessons of this campaign, and still more of operations involving retreat, such as the first battle of Gaza (March 26-27, 1917), or the Beer-sheba reconnaissance (August 23, 1917), all drive home the maxim that all personnel of a cavalry field ambulance should be mounted, the only exceptions being six wagon orderlies, and three R.A.S.C. artificers who ride on wagons and act as brakesmen. The experience with donkeys shows them to be an admirable form of mount for field ambulance personnel—preferable in many ways to horses—but horses are necessary for some, and the following distribution of mounts has proved effective in practice:—

#### Horses:—

Officers	..	..	..	..	5	
Warrant officers and serjeants	..	..	..	..	6	
Bearers	..	..	..	..	20	(4 of these to lead pack mules)
Signallers and gallopers	..	..	..	..	6	
Buglers	..	..	..	..	2	
Transport N.C.O.'s and farrier	..	..	..	..	3	
Officers' grooms	..	..	..	..	2	
Total	..	..	..	..	44	Riding horses

#### Donkeys:—

Personnel of tent section	..	..	..	..	13	
Quartermaster-serjeant, clerk and water duty man	..	..	..	..	2	
Bearers	..	..	..	..	4	(To act as grooms to the 24 donkeys)
Officers' batmen	..	..	..	..	5	
Total	..	..	..	..	24	Donkeys

Some of the objections to such an allocation of mounts which might spring to the mind may be met here and now.

(a) *Expense*.—Though the number of animals is considerable compared with the pre-war establishment, it is actually less than the number allowed by several of the constantly changing provisional establishments issued for the E.E.F. Thus in early 1917 the establishment of a mounted brigade field ambulance (strength 70 exclusive of transport section) allowed 39 riding horses and 42 riding camels. In this, as in all things, complete efficiency is in the long run the truest economy.

(b) *Donkeys*.—Egyptian donkeys are no doubt far stronger and hardier beasts than European and Asiatic breeds in general. There appears to be no reason why they should not be adopted by the British Army operating in any country. They are strong, hardy animals, consume less

than half the forage of a horse, can travel for days without water, are equally at home in hills or desert, and require very little attention. Only in very soft, sandy desert would it be advisable for them to be replaced by riding camels.

(c) *Bearers*.—The allocation of four bearers as grooms to the twenty-four donkeys sets free all the other personnel mounted on them for their respective duties. It might be thought that this and the allocation of four bearers to lead pack mules would unduly reduce the strength of the bearer section. But the narrative shows—and previous campaigns taught the same lesson—that they are seldom employed in the actual collection of wounded, being chiefly used to man the advance dressing station, act as loading parties, escort convoys of wounded, and take charge of dumps of casualties when these have to be formed. Sixteen mounted bearers have been found sufficient for these purposes.

#### (D) EQUIPMENT.

A detailed discussion of this would amount to the drafting of a new Mobilization Store Table; but that the present scale is redundant in some respects and defective in others is a fact familiar to those who remember the recurrent dumping of stores that preceded every campaign in the E.E.F. Much of the difficulty arises from the dual functions performed; during active cavalry operations rapidity of evacuation is everything, and only first-aid treatment and the most urgent operations are possible; on the other hand, during the much more prolonged periods of rest the field ambulance is expected to run a hospital—small indeed, but complete so far as it goes. A method of meeting this initial difficulty is suggested below, and only the equipment necessary for active field work is here discussed. Space, too, precludes mention of any but its most important features.

(1) *Medical and Surgical Panniers*.—That the same pattern of pannier, whether field surgical, or field medical, should form the equipment of two units with such different functions as a general hospital and a cavalry field ambulance is a palpable anomaly; and some of the instruments supplied even in the latest pattern of pannier recall the dark ages of surgery. What is required is a single field surgical pannier specially designed for ambulance work, not one which aiming at a general misses any particular utility. Similarly one field medical pannier is required which should be devoted mainly to drugs and containing such important agents as sera (antitetanic, dysenteric, diphtheritic), soluble quinine, emetine, salol, Easton's syrup, and ampoules with injections of quinine and morphia. Only special bandages such as the many-tailed, elastic webbing, Martin's rubber (an excellent field tourniquet) need be included in it, ordinary dressings being best carried in separate cases such as the reserve dressing box.

(2) *Medical Comforts*.—The medical comforts pannier is totally inadequate. At the opening of the recent campaign we carried five or six hundred-weight of medical comforts, including cases of champagne, milk, cocoa, meat extract, custard, tinned chicken, etc.

(2) *Splints*.—The field fracture box was scrapped, no splint that requires time to be put together being of much use in cavalry work, and was replaced by a varied stock of ready-made splints; large ones, such as Thomas's or the Long Liston being carried in the ambulance wagons and cars.

(4) *Stretchers*.—A large supply is invaluable at the dressing station, and we carried twenty in addition to those in the ambulance wagons and cars. The light bed-rests supplied by the Red Cross are an invaluable addition for putting cases up in Fowler's position. Stretcher bearers, both ambulance and regimental, carried a special light portable stretcher (one per stretcher squad) on the horse.

In other respects the present equipment of a cavalry field ambulance is an excellent basis, but needs revising in detail. Many items can be cut out; for example, a stretcher makes an adequate operating table, the flagpole, with cross-bar, is heavy and awkward, and the removal of one tent division eliminates the whole load of one medical store wagon (see F. S. Manual, A.M.S.), reducing the weight of stores to be carried by roughly one ton. But in working out the loads allowance must be made, not only for the extra stores suggested above, but for the two days emergency forage and rations which almost always have to be carried. A load of 1,200 lb. per limber is a good working basis, though for the severe test of the recent campaign only 1,000 lb. per limber was carried. As ambulance stores are bulky in proportion to their weight, limbers should be (and were) fitted with raves to increase their bulk capacity.

#### (E) L. OF C. ORGANIZATION FROM THE FIELD AMBULANCE TO THE C.C.S.

The rapidly lengthening line of evacuation produced by a cavalry advance always creates the need for some sort of medical station, intermediate between the field ambulance and the C.C.S. F. S. Regs. Part II, lays down that an advanced section of a C.C.S. shall fill the gap; but the tendency of this war has been for a C.C.S. to become expanded into the likeness of a stationary hospital and to be tied to a railway; and in the cavalry campaigns in Palestine the gap in question has been filled by detachments from field ambulances, the so-called "immobile sections," whose work and functions have been touched upon in the above narrative. The "immobile section" of each field ambulance contained all the men whom the establishment did not permit of being mounted. In 1917 this amounted in practice to one tent subdivision, and for the Jerusalem campaign the three existing in each division were formed into a single composite unit called the divisional receiving station. On the advance into Syria the immobile sections contained a number of dis-

mounted Indian bearers as well as nursing personnel and were somewhat differently employed, only two in each division going to form the divisional receiving station, while the third operated separately, and was known as the divisional collecting station.

It will be gathered from the narrative how different their functions were from those of an ambulance, and they suffered from many disadvantages, the chief of which were :—

(1) The units were always thrown together on the eve of active operations ; they thus had all the handicap of a "scratch" team, generally too, of a "second eleven" as, though in the main a tent subdivision, they contained all the dismounted residue of the field ambulance.

(2) In the case of receiving stations they were formed by tent subdivisions from two or three different ambulances ; the officers and men were strange to one another and there was reduplication and overlapping of duties.

(3) The equipment of receiving stations was in duplicate or triplicate and being, in the case of each component subdivision, cut down to fit the transport available, was both redundant and defective.

The case is therefore very strong for the permanent organization of a separate unit for this work whose function would be :—

(a) During active operations to fill in the gap between the field ambulances and the C.C.S.

(b) During periods of rest to receive all sick of the division. Field ambulances would thus be relieved of their present duality of function and their personnel and equipment could be specialized and limited for the work proper to an ambulance in the field.

As the creation of such a unit would place it outside the scope of ambulance work proper, detailed discussion would be out of place, but as experience of its special work is at the present confined to field ambulances, reference to some of its necessary features may not be amiss.

(a) *Personnel*.—A unit with four R.A.M.C. officers and thirty-two men is the equivalent of two tent subdivisions of a cavalry field ambulance, and has met the case ; it should perhaps be organized into two sections, though these would seldom operate separately when a cavalry corps is working as a whole (see below).

(b) *Equipment*.—The equipment of two tent subdivisions (*vide* F.S. Manual, A.M.S.) would be adequate, though many of the previous remarks on equipment are relevant and it would require extra tentage.

(c) *Transport of Personnel and Equipment*.—The problem is that of a unit which would have to travel considerable distances and rapidly ; whose movement would be intermittent rather than continuous (a move every third, fourth or fifth day) ; which would never be called upon to leave main roads and would travel along the line of supplies ; whose personnel are all required for continuous medical work and are not therefore able to look after animals. There is only one form of transport that

satisfies all these conditions, and that is petrol-driven motors. Four three-ton motor lorries would be capable of carrying all the stores and all the personnel, and, as transport is required only intermittently on operations and at other times only when a division moves, they could be supplied when required from a M.T. Company. They would thus be more economical as well as more efficient than any other form of transport. They would, however, require to be supplemented by a permanent establishment of one Ford box-car to draw supplies and water (the latter being carried in fanatis) and two motor cycles for inter-communication, both being furnished with the necessary motor transport personnel.

(d) *Control*.—In the operations of the Desert Mounted Corps the receiving stations have invariably been used in echelon. That is one divisional receiving station (a) received all corps casualties for the first stage of the advance, the others being held in reserve. On the next stage occurring, another receiving station (b) was moved up past the first, and in its turn received all corps casualties while (a) was evacuating. And so on, (c) or (a), as soon as its cases were cleared, being available for later stages of the advance. It was therefore inevitable that their movements should be controlled by the D.D.M.S. of the corps, who arranged for evacuating their cases to a casualty clearing station with a corps motor ambulance convoy distinct altogether from the cars attached to field ambulance. Only in the case of a division operating separately would the receiving station be controlled by the A.D.M.S., who could then use its two sections in echelon as separate receiving stations. He would, of course, require at his disposal a motor ambulance convoy to evacuate them.

Thus the end of our inquiry brings us to something approaching the old organization of South African days, where bearer companies and field hospitals shared between them the medical service of mounted troops. But modern experience and, still more, modern resources, such as the motor ambulance and motor lorry, have modified the old conception in some important respects. The bearer company or field ambulance should be a small, highly mobile and highly trained unit capable of forming an advanced dressing station and dressing station, rather than a company of stretcher bearers proper.

The field hospital or divisional receiving station should be made mobile by motor transport, and one should be provided for each division. It would seldom come into direct contact with the field ambulance, and still less often with the other divisional hospitals of the corps, so that there seems to be no good reason for combining it with the latter into a single unit organized into sections for each division. In fact, if the lessons of two years of cavalry campaigning were summed up in two words, they would be devolution and mobility.

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## Clinical and other Notes.

### SOME INVESTIGATIONS ON THIRTY-FIVE CASES OF PNEUMONIA IN KHARTOUM.

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THE pneumonia cases, which form the subject of this paper, occurred in Sudanese soldiers admitted to the Sudan Defence Force Military Hospital during the winter months of 1923-24, 1924-25. The investigations were carried out with the object of ascertaining the prevailing type of pneumococcus responsible for the disease.

*Laboratory technique.*—The patient's sputum was collected in a sterile Petri dish, transferred to a clean mortar and thoroughly crushed and then placed in a sterile bottle containing glass beads and thoroughly shaken. A smear preparation was then made and stained by Gram's method; if pneumococci were present, 0.5 cubic centimetre was injected into the peritoneal cavity of two rats. When the animals became moribund, the peritoneal cavity was opened and washed with sterile normal salt solution, the washings being used for the bile solubility test and for agglutination tests against the type sera. The heart's blood from the rats was placed in defibrinated rabbit's blood-broth, subcultured after twenty-four hours' incubation at 37° C. on chocolate agar and further confirmatory tests for the pneumococcus were carried out.

In carrying out the agglutination tests, the specific serum was diluted to 1 in 10 then mixed with an equal quantity of the emulsion obtained by washing the peritoneal cavities of inoculated rats, the final dilution being 1 in 20, which was incubated at 50° C. for one hour.

In cases where no agglutination occurred with the specific type serum, the dried spleen of the inoculated rat was forwarded to the Ministry of Health laboratories for further investigation.

*Cases investigated in 1923-24.*—Pneumococci were isolated in sixteen out of twenty-four cases examined; of these eight proved to be Type I, four belonged to Type IV, two were Type II, and the remaining two cases were Type III. There were four deaths, and in each case the organism isolated was Type I. Among the eight cases from which pneumococci were not isolated, in two instances streptococci were obtained from the heart's blood of inoculated rats.

*Cases investigated in 1924-25.*—These totalled eleven cases, and pneumococci were obtained in all the cases. In ten of the cases the pneumococcus Type IV was obtained, and one case yielded a Type II

pneumococcus. Of the eleven cases three were fatal and caused by Type IV pneumococcus; in two of the fatal cases meningitis occurred, the Type IV pneumococcus being obtained from the meninges of the brain.

*Summary.*

(1) Thirty-five cases of pneumonia were investigated and the pneumococcus was isolated from twenty-seven cases.

(2) In the winter of 1923-24 Type I pneumococcus predominated, whereas in the winter of 1924-25 Type IV pneumococcus was the most prevalent.

(3) Among the fatal cases Types I and IV were obtained.

*Acknowledgment.*—Thanks are due to Dr. Griffith, Ministry of Health Laboratories, for assistance rendered.

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### MOSQUITO-PROOF GUTTERINGS.

By F. G. CAWSTON, M.D.CANTAB.

VARIOUS attempts have been made to secure a form of roof-guttering which will not encourage the breeding of mosquitoes around dwelling-houses, but the problem has been so difficult a one that in the Panama zone and other tropical places all roof guttering has been excluded from houses, the rainwater being allowed to fall on to concrete channels along the ground. There is a distinct advantage in using cast iron gutterings, the parapet gutterings, being less easy to inspect, whilst the sheet-iron gutterings tend to erode and get out of shape. However, the cast-iron gutterings would be of far greater service in the tropics, more especially where mosquito breeding is a constant menace to the health of the population, if they were made in moulds five inches in diameter with a depth of the gutter increasing towards the outlet for the water. The present type of guttering is unscientific, for the section area should increase as the catchment-area and volume of water increase towards the the down-pipe. Sheet-iron guttering cut out with converging borders, two inches wider at one end than at the other end of a six-foot piece, when bent so that its edges are parallel, gives a slope of one inch in every six feet. Plumbers find it easier to fix the upper edge of the gutter on a horizontal plane than to tilt up one end to get the required slope and, where a down-pipe is fixed to allow a drop from each end of the roof, a fall of even two inches from each end of a forty-eight foot wall is not unsightly; in fact a gutter with an increasing depth is hardly noticeable from other types except by its better drainage. Where the half-round eaves are used, the gutter is also kept cleaner by the winds and is readily washed clean by the first shower of rain; thus incidentally increasing the life of the gutter. A slope of only one inch in twenty-four feet is considered sufficient for larger buildings, provided the slope is a permanent one, which is ensured by making the gutter with a gradually increasing depth towards the outlet.

## AN UNUSUAL CASE OF POISONING.

By MAJOR R. A. HEPPLÉ, M.C.,  
*Royal Army Medical Corps.*

ON the morning of March 9, 1927, Private — of the — Regiment, aged 21, was admitted to the Military Hospital, Wiesbaden, in an unconscious condition. The history available was that he was believed to have taken the contents of a tin of metal polish or some form of cleaning material. The patient had been unconscious for one hour before admission.

The patient came under the care of Major H. L. Mann, R.A.M.C., and the following notes are taken from the medical case sheet.

On admission at 11 a.m. : Quite unconscious, pupils contracted. No corneal reflex present, but pupils react to light. Temperature, 96.2° F. ; pulse normal in rate, volume and tension good ; respirations somewhat stertorous. Colour good.

The breath smells strongly of something vaguely familiar ; there is no sign of burning of lips or mouth.

Urine drawn off and examined. Tests for sugar, albumin, acetone and diacetic acid were applied, but no abnormal constituent was found.

The following treatment was carried out : Injection *cafein sod. sal.* three grains hypodermically.

The stomach was washed out with four pints of *pot. permang.* solution and fifteen ounces strong coffee were left in the stomach.

The stomach washings were not abnormal in appearance, but had the same smell as noted in the breath. A sample of the stomach washings was sent to the R.A.M. College for analysis. The strong smell was there recognized to be that of tetrachlorethane, but sufficient could not be isolated to apply the necessary chemical test to confirm the presence of this drug.

At 11.50 a.m. the patient's condition was very slightly better. Respiration bad, the tongue having to be held forward with forceps.

Injection *strych. hydrochlor.* hypodermically  $\frac{1}{30}$  grain. An injection of atropin  $\frac{1}{100}$  grain was given at 2 p.m.

At 3.30 p.m. a catheter was again passed and urine examined as before. No abnormal constituent was found. Glucose, brandy and saline were given *per rectum*.

About 5 p.m. respiration became worse. The pupils were dilated. Oxygen was given frequently and tongue held forward continuously. Cold douches were applied to face and inhalations of ammonia given.

After this attack the condition appeared to improve, but no corneal reflex could be elicited.

Throughout the night stimulants and rectal feeds were given without any improvement. In the early hours of the 10th respirations became definitely worse, and signs of the chest filling up developed. Continuous

oxygen and stimulants were given without result. Cheyne-Stokes respiration developed about 3.30 a.m. and the pulse began to fail.

The patient died at 6 a.m. The temperature immediately before death rose to 104·2° F.

A post-mortem examination was carried out on the afternoon of March 10. Captain A. J. Beveridge, M.C., R.A.M.C., kindly assisted me.

The following were the points of interest noted :—

**Œsophagus :** Very little congestion with slight erosion.

**Stomach :** Very much dilated. Mucous surface congested and covered with mucus. At the cardiac end, and also more markedly at the pyloric end, were small areas of superficial erosion which were greenish-yellow in colour. The stomach contained about six ounces of fluid ; this fluid had a strong penetrating odour which was faintly suggestive of chloroform. On standing for a short time this fluid separated into two layers, an upper layer consisting of greenish mucous fluid, and a lower light brown oily layer.

**Small intestine :** This showed no abnormality beyond slight congestion. In the ileum, however, near the ileo-cæcal valve, a small and very superficial erosion of the mucous membrane was found.

**Large intestine :** Showed no abnormality.

**Liver :** Had a slightly patchy appearance, but on section appeared macroscopically normal.

**Kidneys :** Showed marked congestion.

**Spleen ;** Enlarged and congested. Malpighian bodies prominent.

**Lungs :** Trachea and large bronchi slightly congested.

Both bases were intensely congested. This was particularly marked on the left side. On section the lungs exuded blood-stained serous fluid in considerable quantity.

An interesting feature was the persistence of the thymus gland, which weighed sixteen grammes. The superficial and deep cervical glands were much enlarged, a condition which was also found in the bronchial glands.

This condition is of much interest, as the patient had an appendicectomy performed at the Military Hospital, Devonport, in 1925. Inquiries have elicited the information that the anæsthetic used was chloroform and ether mixture.

Portions of the following were removed for section: Lung, left and right bases, kidney, liver, and thymus. The results of microscopical examination were as follows :—

**Lung, left base :** Intense congestion of interalveolar vessels, with rupture into the alveoli in many places. In one area the commencing entry of the polymorphs was apparent.

**Right base :** A similar condition, but slightly less marked.

**Kidney :** Congestion and very marked cloudy swelling, particularly marked in the convoluted tubules.

**Liver :** Cloudy swelling and congestion.

**Thymus :** Showed normal thymus tissue.

*Chemical Analysis.*—The following organs, etc., were removed for chemical analysis : Stomach contents ; portion of small intestine with contents ; blood ; bile ; liver ; kidneys. The analysis was carried out by Dr. Fresenius, the public analyst, Wiesbaden. As it was obvious that the stomach contents contained some foreign substance which was presumably toxic, analysis was restricted to these contents, and as the poisonous substance sought for was found in the stomach contents, analysis of the other fluids and organs was not proceeded with.

By distillation twelve cubic centimetres of a fluid with a specific gravity of 1.6 and a boiling point of 147° F. was obtained. By further tests this was proved to be tetrachlorethane ( $C_2H_2Cl_4$ ).

The high specific gravity of tetrachlorethane appears to explain why so little tetrachlorethane was contained in the stomach washings obtained before death.

Further investigation has elicited the information that the cleaning material suspected to have been taken was "Silk Cleansing Fluid," issued by H.M. Stationery Office, and used for cleansing the silk fabric used in a duplicating apparatus. A tin of this fluid was also analysed by Dr. Fresenius and found to consist of tetrachlorethane.

#### COMMENTS.

That tetrachlorethane is highly toxic is well known. It was one of the constituents of the "dope" or varnish which was used in aeroplane factories in the early years of the war for rendering the wings of aeroplanes impervious to moisture. Up to July, 1916, when its use was discontinued, seventy cases of toxic jaundice due to inhalation of the vapour of tetrachlorethane were recorded, resulting in twelve deaths. Dr. Fresenius informed me that the German experience was similar to our own, and that its use in Germany had been prohibited for several years. Wilcox, Spilsbury and Legge [1], investigating this form of toxic jaundice, found that the inhalation of tetrachlorethane gas caused first fatty change in liver, kidneys, and heart, and then extensive degeneration of the liver cells. The onset is insidious and jaundice is a very marked feature [2].

Parmenter [3] has made some interesting observations on the blood pictures presented in a series of cases of tetrachlorethane poisoning by inhalation, and has reached the conclusion that cases of toxæmia from this cause may be detected by blood examination before other toxic symptoms are manifest.

These investigations apply entirely to the conditions produced by inhalations of tetrachlorethane. Extensive inquiries have been made, but, as far as can be ascertained, there is no record in literature regarding poisoning from swallowing tetrachlorethane.

On communicating with Major W. R. Galwey, O.B.E., M.C. (late R.A.M.C.), Director of Experiments, Experimental Station, Porton, on the

subject, he very kindly arranged for Surgeon Commander A. Fairley, R.N., the Superintendent, Physiological Department, Experimental Station, to carry out the following experiment at Porton. Surgeon Commander Fairley's report is as follows :—

To a healthy rabbit one cubic centimetre of tetrachlorethane was administered orally. Within ten minutes the animal became semi-comatose with flaccid limbs and slow laboured respirations. Corneal reflex was present, although dull. This condition lasted for five hours, when the animal was practically moribund.

The post-mortem revealed no lesions in the stomach, which was, however, full of food, nor in the intestines. The other organs, apart from extensive cystic infection, appeared to be normal. The action of the drug, as judged by this isolated experiment, appeared to be a powerful narcotic with its effect on the central nervous system. No evidence of a corrosive action was present.

I am very grateful to the officers mentioned in the text for much assistance in compiling these notes, and also to Lieutenant-Colonel W. C. Croly, D.S.O., O.C. Military Hospital, Wiesbaden, and Colonel Cumming, C.B., D.D.M.S., British Army of the Rhine, for permission to publish the history of this unusual case.

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## Echoes of the Past.

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### DIARY OF A FIELD HOSPITAL DURING THE SOUTH AFRICAN WAR.

BY LIEUT.-COLONEL G. H. YOUNGE, F.R.C.S.I.  
*Royal Army Medical Corps (Ret.).*

(Continued from p. 384).

At daybreak on February 27 a furious bombardment started, every British gun opening fire on the Boer trenches, and this continued without intermission until 3 p.m. During that time the fighting was practically an artillery duel, and as our guns had dominated the Boer artillery no fresh cases were coming in. We were, therefore, able to watch every phase of the battle which, from our elevated position on Hlangwani, lay spread out below us like a huge panorama. At 3 p.m. the artillery suddenly ceased fire and eleven infantry battalions advanced to storm the Boer position. We watched them rapidly working round the Boer left flank, saw them

carry the main position at the point of the bayonet, and finally watched the Boers streaming from their trenches. Almost immediately a continuous stream of wounded, including many wounded prisoners, began to arrive, and we were kept hard at work all night long.

During the afternoon of February 28 the following telegram was received by the Irish Brigade from Her Gracious Majesty Queen Victoria with, as may be imagined, feelings of the deepest gratification: "I have heard with the deepest concern of the heavy losses sustained by my brave Irish soldiers, and desire to express my sympathy and my admiration for the splendid fighting qualities which they have exhibited throughout these trying operations."

About 6 p.m. that evening the advance guard of Lord Dundonald's Cavalry entered Ladysmith.

During the next five days the hospital was crowded with severe gunshot wounds, and the staff were kept hard at work from early morning to midnight. We were, therefore, unable to accompany our Brigade when they made their official entry into Ladysmith at the head of the relieving column—a position given them in honour of "their splendid fighting qualities."

During the afternoon of March 2, I snatched a couple of hours to inspect the waterfall, the pontoon bridge and the late Boer position. The latter was simply appalling in its strength. The river was broad, deep, rapid and winding. On both sides there were innumerable steep and rugged hills of every conceivable shape, and varying in height from 500 to 2,000 feet or more. Many of them were almost perpendicular, and most of them were thickly covered with dense mimosa scrub and huge boulders so that an army corps might have lain hidden amongst them without a man being visible. Many of the Boer trenches also were almost works of art, so perfect were they in construction.

Early in the morning of March 5 orders were received to evacuate the hospital as quickly as possible and to march to Ladysmith to rejoin our Brigade. One hundred and forty cases were placed on Colonel G. W. Brazier-Creagh's ambulance train for transfer to the General Hospital, and at 2 p.m. we marched out of Colenso via Groblar's Kloof, passing through the centre of the late Boer position. After a most interesting march of ten miles we camped for the night at Onderbrook Spruit.

We entered Ladysmith at 10.15 a.m. on March 6 and camped for the day at the foot of Cæsar's Camp, the centre of the fierce Boer attack on the town on January 6, in which the Devonshire Regiment covered itself with glory.

Ladysmith, the goal of all our hopes for three long months, might aptly be described as a town in corrugated iron, as almost every house in it is roofed with this material, the bright, silvery gleam from which was both striking and attractive. This is, indeed, a feature of most South African towns and houses, as slates and tiles are rarely, if ever, used, owing, I

believe, to the certainty of their being destroyed by the terrific hailstorms which occur there, in which many of the individual hailstones are solid lumps of ice which vary in size from a pigeon's to a small hen's egg.

The town is situated on the western border of a huge, level, circular plain, and is surrounded on three sides by low, flat-topped hills, amongst which are Waggon Hill and Cæsar's Camp. The Klip River meanders along the eastern side, and beyond this a rugged plain, seamed with spruits and dongas, extends for five miles and then ends in the famous Lombard's Kop and Umbulwana Hill. An object of much interest was the huge dam constructed by the Boers across the river during the siege. It was made of sandbags and was of enormous size. Its construction during the siege led to wild rumours and much excitement amongst the garrison, as they believed that the object aimed at was to flood the town and so drive them out of it. Owing, however, to its level being much below that of the town, no blocking of the river *could* flood the town, so that the real object in making it must have been to keep a large reserve of water on hand.

Early in the morning of March 7 we marched through Ladysmith *en route* to join our Brigade, who were encamped at Thornhill some two miles north of the town. Considering that during the siege some 16,000 shells had been thrown into it by the Boer artillery, the damage done to the town seemed incredibly small. There was a large gap in the clock tower of the Town Hall. A shell had passed through its roof and another through its front wall close to the ground. The principal hotel had a yawning gap in its roof, and perhaps half a dozen private houses showed lesser damage.

An indescribable gloom seemed to rest on the town, however. The shops were empty and deserted; their windows covered with grime and mildew; whilst the few men visible looked like emaciated ghosts, whose uniform hung about them in loose folds. The gloom was not dispelled by a visit to Intombi, a neutral strip of ground on which the General Hospital stood. It contained some 800 patients, mere wrecks of humanity; whilst some little distance away was a forest of white headstones, which marked the graves of 1,600 men who had been killed or had died of disease during the siege.

Hardly were our tents pitched when four cases of enteric fever were admitted, the first we had seen since reaching Natal. There was a definite history that during the battle of Pieter's Hill, which lasted seventeen days, the men had occupied old Boer trenches at Colenso and had drunk water from stagnant pools at the foot of the hills. It was also noted that cases of dysentery were becoming more numerous and more severe.

On March 8 casualty returns of the gunshot wounds admitted at Pieter's Hill were submitted, of which the following is a summary: Head, 21; face and neck, 17; chest, 21; abdomen, 19; back and spine, 14; upper extremity, 82; lower extremity, 157; total 331.

On March 17 the hospital celebrated St. Patrick's Day in the good old



style in honour of the Irish Brigade, drowning the shamrock in champagne specially ordered from Pietermaritzburg for the purpose. Practically every man, woman and child in Natal wore shamrock for the same reason—to commemorate the heroic work of the Brigade.

During the rest of the month there was nothing special to note. The hospital remained full to overflowing; the work was heavy and a steady increase in the number and severity of cases of enteric fever and dysentery was noted.

On April 4 Captain J. Hirst, Lieutenant R. S. Hannay and I rode out to inspect Umbulwana Hill. We tethered our horses to a stunted tree at the foot of it, and with infinite toil climbed its almost perpendicular sides. Like most South African hills, its top was quite flat. Strewn over its surface were many tons of loose unused rifle ammunition, which the Boers had thrown away before they evacuated the hill. From amongst these I picked up many specimens of so-called "poisoned cartridges," which are still in my possession. The bullets were covered with a thin, light green coating, which seemed to me simply verdigris. Many men who had been wounded by these bullets passed through our hands, but as far as I could see the green coating had no bad effect on their wounds.

We sat down on the spot so long occupied by "Long Tom," and I ate my first stick of the Queen's chocolate. What puzzled us was how the Boers ever succeeded in getting that huge gun on to the Umbulwana. The hill was at least 300 feet high, its sides were almost perpendicular, and were covered by gigantic boulders and dense but stunted thorn-bushes; whilst only one narrow path, the steepest and most rugged I had ever climbed, led on to it. It only showed the indomitable grit and patience of our enemies.

Early in April Lord Roberts wired for the Irish Brigade to join the force under his command at Bloemfontein. At the time of its departure every hospital in Natal, including the Brigade Hospital, was crowded to its utmost limits with sick, including many severe cases of enteric fever, dysentery and gunshot wounds. We were, therefore, unable to accompany the Brigade. On their departure we were temporarily attached for duty to General Sir Archibald Hunter's Division, which was composed largely of members of the late Ladysmith garrison. I find an interesting note to the effect that, following their return to a full diet, most of the men developed a more or less marked form of jaundice. On April 19 there is a note to the effect that a man of the R.A. was admitted with scarlatina. The patient was rigidly quarantined and was also anointed with boric ointment to check dissemination of infection, and there were no further cases.

At 8.30 a.m. on May 1 I received a telegram from the P.M.O., Natal Army, saying, "Transfer all your cases to No. 1 Stationary Hospital and entrain at once for Durban." The stationary hospital was half a mile away, and we had 127 cases which could only be moved on stretchers. To add to our difficulties the day was fiercely hot. Thanks to the splendid

work of the Natal Volunteer Ambulance Corps,' however, all the cases were transferred and the tents and equipment packed and loaded on trucks in time to catch the 1.30 p.m. train. Whilst the work was in progress we had a narrow escape from fire. The hospital site was covered with long, dry grass. As the last patient was carried off, and whilst the tents were still standing, this somehow caught fire about 100 yards from our camp. The flames seemed to race towards us, but our men turned out with wet sacks and somehow got the fire out. Only just in time, however, for in several places it had got to within a few feet of the tents.

We longed to have a last look at the ground over which our men had fought so splendidly, but unfortunately it was quite dark when we passed Colenso. We reached Durban at noon on May 2, and went straight on board the S.S. "Colombian." She sailed at 5 p.m., steaming quietly down the coast to East London. After all the worry, excitement, labour and din of the past six months those two delightful, restful days at sea seemed like a foretaste of heaven.

East London is a pretty place, built on ground which slopes rapidly upwards from some fairly high cliffs. I remember it chiefly, however, for one of the most splendid sunsets I have ever seen. A lovely stream, the Buffalo River, flows into the sea through the town. Its banks are steep, almost precipitous, and beautifully wooded. Looking up the stream, the whole western sky was seen to be a mass of gigantic storm clouds. As the sun sank behind them they became transformed into every conceivable colour—from the most tender pink to the most fiery red and crimson; from a delicate saffron to a flaming orange; from the palest blue to the most lowering shades of indigo and violet; from a dazzling white to a slaty black. Great iridescent streamers, scintillating with every imaginable colour, shot up to the zenith. As the sun neared the horizon it suddenly burst from the clouds. Its rays seemed literally to pour down the river, and the play of colours on the water could only be compared to a hundred rainbows compressed into one. Could that sunset have been faithfully transferred to canvas there is not, perhaps, a critic in England who would not have maintained that such a combination of colours had never been seen in the heavens.

We left East London at 8.30 p.m. *en route* for Bloemfontein. During that and the following day we travelled through landscape composed of undulating hills and kopjes of every shape and variety; now clothed with yellow-green grass, now covered with huge, dark-brown boulders. Many of the kopjes were flat-topped and were crowned with mighty rocks, composed of perpendicular strata, which gave them the appearance of vast pillars and columns. Between the hills were long, undulating, fertile valleys intersected with deep dongas. There was an almost entire absence

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<sup>1</sup> This corps was raised by Sir Thomas Gallwey principally from Johannesburg refugees, and did magnificent work during the Natal campaign.

of trees, but here and there patches of brilliant green mimosa covered the southern slopes of the hills. Dotted at intervals on the hill-sides pretty farmhouses could be seen nestling amidst lovely palms and eucalyptus trees, and surrounded by enormous herds of sheep. Indeed, those herds of sheep were a striking feature of the landscape. They were so numerous that they seemed to cover the hill-sides; so white that they almost dazzled the eye. Wherever even the tiniest pool existed magnificent weeping willows charmed the eye. From time to time the train disturbed vast swarms of locusts, which then seemed to fill the air. Here, as on other parts of the African veldt, time seemed of absolutely no consequence. Our train, which was a special, was three hours late, and yet the guard was willing to stop it at any place or time we desired.

Queenstown was reached at 3 p.m. It is a large town, situated on a plain which is surrounded on every side by steep hills. From the railway the houses seemed almost hidden in lovely palms, firs, weeping willows, tapering poplars and eucalyptus trees. Contrasting with the brown veldt the effect was striking and beautiful. The railway up to Queenstown ascends at a steep gradient, winding in and out amongst the hills. Shortly after leaving the town the higher veldt was reached, and the line then became comparatively level. Sterkstroom and Burgersdorp were passed during the night, so that we saw nothing of them.

We crossed the Orange River at 4.30 p.m. on May 6. The original railway bridge had been blown up and the traffic was carried on over a temporary trestle bridge. The road bridge, however, was still intact, and was a splendid structure of twenty spans. The first view of the Orange River Colony was dismal in the extreme—a desolate plain with a few barren kopjes showing on the horizon. (The town of Bethulie, situated about a mile north of the river, was a miserable place, consisting of a few dozen shabby-looking houses with the inevitable corrugated iron roofing. There was one striking feature about the place, however, a splendid avenue of trees leading up to a handsome church, which would have done credit to any town in England.

We reached Bloemfontein some time during the night, but slept peacefully in the train until the morning. About 6 a.m. I scrambled out of the carriage and dug out a zinc bucket from amongst the equipment. Having filled this at the pump which supplied the engines, I stood between the metals and had a thorough wash which, after sixty hours' continuous railway travelling, was a luxury indeed—in spite of the fact that the ground was thickly covered with hoar frost. I then started to explore Bloemfontein. The town is situated on a vast, semi-barren plain, which stretches away eastwards as far as the eye can reach, broken only by two or three dismal kopjes. Towering about the town on the west side are three steep hills, the sides of which are thickly covered with mimosa shrubs. Bloemfontein consists of two main thoroughfares, which cross one another at right angles. At the point of junction there is a large and handsome

square, in which stand the principal shops, the post office, a fine club and other buildings. Numerous side streets run off at right angles from the main thoroughfares. A conspicuous feature of the town is a handsome Dutch church, with two spires at the east end. The Raadzaal, a really handsome building, and the Residency, so long occupied by President Steyn, were on the northern outskirts of the town. There was also an English cathedral—a plain building without spire or decoration of any kind—and after six months on the veldt it was delightful to attend the services and to hear our beautiful liturgy once more.

We had fondly hoped that it might be our good fortune to be present at the relief of Kimberley as well as that of Ladysmith. Unfortunately, this was not to be, as on reporting our arrival to the P.M.O., Colonel J. Stevenson, C.B., I was informed that the hospital was detailed for garrison duty at Bloemfontein, and I was ordered to equip a stationary hospital of 250 beds as quickly as possible. An excellent site was selected on the plain, east of the magazine, at a point where the Royal Engineers were then busy sinking an artesian well, which eventually tapped a splendid supply of water at a depth of 350 feet.

As the railway was again running smoothly, after its destruction by the Boers, there was no longer any difficulty over stores and equipment. It was possible, indeed, to get anything and everything one asked for. On May 13 the equipment of the hospital was completed, and on that date I find the following note: "Hospital crowded with sick, largely enteric fever cases." In addition to the sick of the garrison we received constant convoys of sick and wounded from the front.

May 28, 1900, was a red-letter day for the Bloemfontein garrison. Every officer and man not on picket duty was ordered to attend the proclamation parade in the Town Square at noon. On reaching it we found it completely surrounded by a double row of troops, each four deep, with a wide avenue between. Within the square stood a newly-erected flagstaff, on which were the Union Jack and the Royal Standard, rolled into small coils. Grouped round this were all the officers not on duty with troops. At the stroke of noon General Prettyman rode into the square, and in a clear voice read Lord Roberts' proclamation. As the last word died away a string was pulled, the two flags floated gracefully out on the breeze, the massed bands burst into the National Anthem, a mighty cheer broke from the troops, and the Orange Free State had become the Orange River Colony. It was, indeed, one of those moments which are worth a lifetime.

On June 10, Major-General Sir W. D. Wilson, K.C.M.G., P.M.O. of South Africa, inspected the hospital and approved of its site, its equipment and its water supply. After the inspection he instructed me to draw an additional fifteen marquees and to equip 100 fresh beds. On June 12, Nursing Sisters J. M. Dacent, A. B. Briscoe and F. H. Rhodes joined the hospital for duty on arrival from England.

On June 15 I reported the additional marquees as fully equipped with every hospital requisite, and I find the following note: "I visit the wards daily, ask if there are any complaints, if the patients are warm enough, if they have everything they need. Up to now I have not had a single complaint. Medical comforts and requisites are now obtainable to any amount."

On June 19 the G.O.C. 3rd Division, Major-General Sir H.C. Chermiside, G.C.M.G., inspected the hospital at 11 a.m., and congratulated all concerned on its appearance and equipment. Indeed, the snow-white tents and marquees, pitched with mathematical regularity, formed both a striking and handsome picture.

On June 30 I find the following note: "There has lately been some difficulty about fresh milk. Only forty to fifty pints a day can be obtained. I reported the matter to the P.M.O. Fresh milk is now only given when specially prescribed. Personally I prefer 'Ideal tinned milk' to any other. It is sterilized and is richer, more nutritious and more palatable than any fresh milk which can be obtained in Bloemfontein."

The nights were bitterly cold with a heavy hoar frost, but they were made lovely by that splendid moonlight which one sees only in or near the tropics. This was so brilliant, so mysterious, and yet so soft and glorious, that the thought often occurred to me as we rode across the veldt at night-time, "Surely the light of heaven must be something like this." The nights were made additionally lovely by the presence of a vast comet of stupendous size and brilliancy. In shape it almost exactly resembled a cockade, except that the expanded part was slightly curved downwards; in size it covered a great part of the western sky, resting in an almost horizontal position.

On July 15, 1900, I received orders to send the left half of the hospital to Elandsfontein to equip a stationary hospital of 250 beds there, and on July 20 they left by rail, with Captain E. M. Pilcher in command. They took over the offices of the Simmer and Jack Mine at Germistan and equipped a hospital which subsequently expanded into No. 16 General Hospital.

As the Brigade were now on the Transvaal border and expected to be heavily engaged with the enemy at any moment, the G.O.C. urgently requested that the hospital be ordered to rejoin. On July 30, therefore, I handed over command of the stationary hospital to the late Lieutenant-Colonel R. P. Hetherington, R.A.M.C., and on August 5, after three happy but strenuous months, we left Bloemfontein to rejoin our Brigade at Rhenoster. If it were possible, I would like to give an accurate description of our journey up country. At that time, except for hospital trains, passenger carriages were not allowed to run, as every train was made up of a long line of trucks carrying stores and ammunition to the front. The only accommodation for officers, therefore, was a brake-van. This was already full almost to the roof with boxes of ammunition, mail-bags, and a

miscellaneous collection of odds and ends. Nine of us scrambled in as best we could and tried to make ourselves comfortable sprawling on the top of the lumber. At one moment we were spitted on the sharp corner of a box, at the next our heads were being battered against the roof. We were better off than the men, however. *They* had to travel on the tops of heavily-laden trucks without cover of any kind. As there were 5° to 6° of frost and a bitter wind, it is not difficult to imagine what their sensations were like.

The train reached Kroonstad at 3 p.m. and halted for the night, as it was not considered safe to travel in the dark. The town was a miserable place, a collection of rambling, dishevelled huts erected on a hideous plain, which was seamed in every direction by deep dongas.

We were timed to leave again at 8 a.m. on August 6, but as we were about to start news arrived that a quantity of dynamite had been discovered a couple of miles down the line. This caused a long delay, and when we started an armoured train steamed just ahead of us for protection.

Roodeval was reached at 3 p.m. Here we had our first introduction to De Wet's handiwork. The station was completely demolished, the line torn up and a heavy train derailed. After taking what they needed the Boers had set fire to the remainder. The woodwork of the trucks had entirely disappeared, only the metal fittings being left. The ground for some distance was littered with the charred remains of heavy great-coats—coats which would have been worth their weight in gold to our half-frozen troops in the Transvaal.

Rhenoster was reached at 3.30 p.m. Close to the station three bridges had been blown up and half-a-mile of the line destroyed. An order awaited us to detrain and camp at the station until further orders. As our Brigade was again on trek, and as there was not a stick of transport available, we were informed that it was impossible for us to join them at present.

Here is an extract from my diary, dated August 9, 1900: "Rhenoster is without doubt the most miserable hole I have ever seen. We are camped on the top of a low stone-clad kopje, which is covered with schanzes. All round is a vast, barren plain, broken only by two or three desolate kopjes. There is nothing to see and nothing to do. The plain around is strewn with dead animals, the stench from which is appalling. The water from the only available pool is slate-coloured. Porridge made with it this morning was quite black. The ration meat last night was tougher than leather and quite uneatable."

I have often been asked how I managed to keep a diary during the war. As a matter of fact I kept both an official and a private diary without difficulty by simply devoting a few minutes each evening to them, and I would strongly recommend all C.O.'s in the field to do the same, as I have found those diaries a constant source of amusement and interest, and of service to me.

The longest day must end, however, and so on August 16 we left Rhenoster, with thankful hearts, under orders for Krugersdorp. En route we passed through the heart of Johannesburg. The view from the train was splendid—palatial houses and public buildings half hidden in a forest of lovely, semi-tropical vegetation. After long months on the bare veldt it seemed like a peep into another and happier world. During a halt of several hours at Johannesburg West, I explored part of the town including Government Square and the Stock Exchange. There was not a soul to be seen. The town was like a city of the dead.

Krugersdorp is situated on an undulating plain and is a really delightful little place. To the eastward are huge groups of hills with long, undulating valleys between, in one of which Dr. Jameson and his force were captured. A large and handsome square occupies the centre of the village, from which two magnificent avenues of eucalyptus trees run east and west. This was a thing which always puzzled me in South Africa. When planted round houses and in towns trees grew luxuriantly, and yet they were completely absent from the veldt. It must be due, I imagine, to the extreme dryness of the climate. That they could be grown on the veldt, and with a huge profit also, I am convinced, if only the requisite amount of care was given to them.

At this point I may, perhaps, say a word or two about the climate of South Africa. This is really delightful. The air is so clear that scenery and large objects are plainly visible at many miles distance. It is so pure that it invigorates one like a draught of some powerful stimulant, so that lassitude and depression of spirits seem utterly impossible. Except during periods of dust-storm, the land is bathed in brilliant sunshine for practically twelve hours daily. The sun does not affect one injuriously, however, as it so often does in tropical countries like India. During the time I spent in South Africa I did not see a single case of sunstroke, although our men were constantly exposed to every vicissitude of climate and weather. During December, January and February, the heat is great, but it can be borne with little discomfort. On the other hand, during May, June and July the nights are cold, in the Transvaal bitterly cold, but with the comforts of a good house and fire, which of course we could not enjoy during the war, this was rather an advantage than otherwise.

On August 22 our Brigade marched into Krugersdorp, and we rejoined them once more for duty. Its composition was very much changed, however. Two of its old battalions had been detached for duty on the lines of communication. It now consisted of the 1st Connaught Rangers, 2nd Dublin Fusiliers, a squadron each of the Imperial Yeomanry and of Marshall's Horse, with two naval and two R.A. guns. It had ceased to be known as the Irish Brigade and had become the "Potchefstroom Column." Our duty was to clear the district of armed bodies of the enemy and to aid when necessary in the pursuit of De Wet. This meant many long and harassing marches. To describe our wanderings day by day, however,

would only be wearisome. I shall, therefore, select two or three extracts as typical examples of the work we had to do, only premising that encounters with the enemy were of almost daily occurrence.

At 4 p.m. on September 9 General Fitzroy Hart, C.B., published an order saying that he was about to call on the column for special exertions the object being to surprise Potchefstroom at daybreak. We fell in at 5 p.m. and did a forced march, during which the infantry covered thirty-five, and the mounted troops forty-five, miles, and in addition had to ford two swollen spruits. The men were in position by daybreak, occupying trenches round the town which had been constructed by the enemy. By noon the town was in our hands and with it many prisoners and many stands of arms.

As we marched into Potchefstroom after its capture, the town presented an appearance it would be difficult to forget. It consisted of one perfectly straight main street, nearly two miles long, from which side streets branched off at right angles. Down each side of the main street ran a babbling stream, along which grew a continuous line of magnificent weeping willows, whose tendrils reached almost to the ground. The houses, with hardly an exception, were one-storied bungalows with deep latticed verandahs, up which grape vines grew in profusion. Each bungalow stood in its own garden of from one to two acres. These were packed with fruit trees, principally peaches, all of which were in full bloom at the time. To our tired eyes that morning the town seemed a perfect paradise.

On September 23 another call for special exertions came—indeed, they came at fairly regular intervals. A large body of Boers were reported to be laagared in a deep valley near Eleza. We left Frederickstad at 10.30 p.m., and marched for twenty-seven hours with only four brief halts of half an hour each. During that time we covered, by the lowest estimate, thirty-seven miles and had several smart brushes with the enemy. And the reward of all this exertion? Well, as we climbed the hills on one side of the Eleza Valley, we saw the Boers flying over those on the opposite side, four miles away. "Alice," one of the naval guns, certainly dropped half-a-dozen shells amongst them, but that was a poor consolation. At this distance it is difficult to realize how heartbreaking, indeed, how absolutely killing, this kind of work was to the troops. They were clad in thin khaki, exposed to bitter cold at night, indifferently fed during the day, had to drink water so vile that in England one would not even wash one's hands in it, and with all this were called upon to do long and exhausting marches. But the worst and most trying part of it all was that there was no apparent result, nothing in fact to show for all their exertions.

One more record of our marches and I have finished. On November 20, 1900, *réveillé* sounded at 4 a.m. and we marched at 5.30 a.m. At 2 p.m. a terrific storm of hail set in and lasted for two hours. South Africa is famous for its hailstorms; but this one *must* have been a record. The hailstones, which were literally solid lumps of ice, varied in size from a



pigeon's to a small hen's egg. They fell so thickly that men and horses at thirty yards were almost invisible. When the storm began we were about to cross a dry spruit. When it ended the ground was covered six inches deep with what was practically solid ice ; the spruit was a roaring torrent, quite unfordable. We had, therefore, to bivouac for the night on its banks. To me that night was the "last straw." Sleeping on ice brought on a violent attack of sciatica plus a bad relapse of old Indian malaria. I hobbled about as long as possible, but on December 8 I could hold out no longer and was sent into Potchefstroom. After ten days rest I felt so much better that I was ordered to take over the duties of S.M.O. of the station and to equip a stationary hospital. As the town was now the centre of "Kitchener's drives," the medical work was arduous and responsible.

There was a handsome two-storied block of railway offices. They were so airy and well-ventilated that they might have been specially built for a hospital. The lower rooms were converted into wards, the upper ones made splendid stores. Marquees were pitched on the lawn in front, and in ten days a hospital of 200 beds was ready.

I find the following note, dated December 17, 1900: "To-day I inspected the old fort in which the Royal Scots Fusiliers were besieged in 1881, which is close to my quarters. It is thirty yards square and is surrounded by an earthwork four feet high and loopholed at the top. Close to the fort is a walled-in graveyard, in which sixteen men who were killed during the siege are buried. A wooden cross, bearing the following inscription, stands inside ; "R.I.P., in memory of our comrades of C and D Companies, who fell during the siege of Potchefstroom, 1881. Erected by their comrades of D Company, who were besieged at Potchefstroom, July 19, 1900." "Avenged 1900," is printed on one of the graves in white stones. A tablet, on which the men's names are recorded in full, has been erected to their memory in the parish church.

The duties of S.M.O. were varied and interesting. They included the sanitary charge of the huge burghers' camp in the neighbourhood and also the re-clothing of most of the men who came to hospital.

The work on column was so heavy and arduous that it often-times reduced a man to rags in a few weeks. The G.O.C.-in-Chief, therefore, sanctioned an equipment store as part of the hospital establishment. I had only to wire to Pretoria to obtain anything necessary in a few hours. The following interview may be given as a good illustration of what happened almost daily: A ragged and footsore soldier limped into the office. I said, "Well, what is the matter?" Soldier: "It's my uniform and boots, sir." On inspection I generally found the uniform a mass of rags, whilst the soles of the boots had more or less disappeared. Taking a slip of paper, I wrote, "Please fit Private T. A. with uniform and boots, and said, "Take this to the Quartermaster upstairs." In a short time the man returned, transformed from a ragged scarecrow to a smart, well-dressed soldier. I asked, "Well, are you all right?" Soldier: "I'm all

right now, sir." I said, "Very well, you can rejoin your column," and the man saluted and walked off looking as happy as a king.

The sciatica did not improve, however. Day or night I was never free from pain, and in addition I had frequent relapses of malaria. After eight months of this my health gave way completely and I was sent sick to England. Before starting I handed over command of the hospital to Major (now Major-General) W. W. Pike, on July 8, 1901, exactly twenty-one months to the day after it had opened for the treatment of sick at Frere.

The following table shows the total admissions to the hospital for all causes during that time :—

TOTAL ADMISSIONS INTO NO. 15 FIELD HOSPITAL FROM DECEMBER 9, 1899,  
TO JULY 8, 1901.

	Cases	Deaths
Gunshot wounds .. ..	1,140	38
Other injuries .. ..	313	1
S. C. fever .. ..	972	..
Enteric fever .. ..	595	65
Dysentery .. ..	751	9
Malaria .. ..	133	..
Venereal .. ..	108	..
Rheumatism .. ..	351	..
Other general diseases .. ..	296	..
Eye and ear .. ..	53	..
Circulatory system .. ..	60	..
Respiratory system .. ..	114	3
Digestive system .. ..	473	1
Genito-urinary system .. ..	50	..
Connective tissue and skin .. ..	461	..
N. Y. D. .. ..	413	..
	6,283	117

*Disposal.*

Discharged to duty .. ..	1,584
Died .. ..	117
Transferred to base .. ..	4,582
	6,283

Percentage of deaths = 1·9

ANALYSIS OF GUNSHOT WOUNDS.

Regions	Colenso	Spion Kop	Pieter's Hill	Other actions	Total ad- missions	Percent- age of totals	Deaths	Percent- age of deaths to cases
Head .. ..	25	38	21	8	92	3·0	12	13·0
Face .. ..	8	10	10	2	30	2·6	1	3·3
Neck .. ..	6	12	7	2	27	2·4	..	..
Chest .. ..	19	29	21	16	85	7·4	9	10·6
Abdomen .. ..	23	16	19	8	66	5·8	12	18·2
Back and spine .. ..	21	15	14	10	60	5·3	3	5·0
Upper extremity .. ..	83	89	82	34	288	25·3	..	..
Lower extremity .. ..	129	154	157	52	492	43·2	1	0·2
Total .. ..	314	363	331	132	1,140	100·0	38	3·3

The above table shows the distribution and percentage of regional wounds at a glance. If, on the other hand, we classify them by degree we get: Slight, 603 or 53 per cent; severe, 366 or 32 per cent; dangerous, 171 or 15 per cent. Or by the form of projectile we get: Shell wounds, 87 or 7·6 per cent; rifle wounds, 1,053 or 92·4 per cent (see R.A.M.C. JOURNAL for August, 1904). The latter figures, however, are probably somewhat deceptive, as no doubt a large percentage of shell wounds are suddenly or rapidly fatal and are, therefore, never seen in the hospitals. Indeed, several of the above deaths occurred before the patients reached the hospital, but as the men had left the field alive they had to be accounted for in the hospital returns.

Simple continued fever has always seemed to me a distinctly unsatisfactory diagnosis. It seems scarcely conceivable, indeed, that a simple pyrexia, without any pathological change, could continue for weeks, as some at least of the supposed cases do. For this reason I have sometimes thought that it would be an advantage if the term were altogether omitted from future editions of the nomenclature of diseases.

Febricula might with advantage be substituted—with a clearly-defined note that it was a disease of a few days' duration and unaccompanied by any definite pathological lesion. Most of our cases were examples of mild fever due to fatigue, exposure to the sun, or other definite cause, and none of them were fatal.

As far as I know, no case was returned as enteric fever unless the symptoms were so clear and distinctive as to allay all uncertainty as to the diagnosis. I have little doubt, therefore, that some at least of the cases returned as simple continued fever, or as not yet diagnosed, were in reality mild or modified cases of enteric. A large proportion of the cases actually diagnosed as such were of a very severe type. Many of the fatal cases, especially in Bloemfontein, died with symptoms of perforation, due apparently to deep and spreading ulceration.

Hæmorrhage was not infrequent, and in some cases was severe. On the whole, unless profuse, it did not appear to be a symptom of any great gravity. Indeed, some at least of the cases appeared to be benefited by a slight hæmorrhage.

Constipation appeared to be the rule, and was certainly one of the most troublesome symptoms.

A very profuse rash was repeatedly noted; in some cases so profuse as to almost resemble scarlatina.

Amongst sequelæ femoral phlebitis was of common occurrence, so common indeed as to be quite remarkable. As far as I can recollect, all the cases ended in recovery, but the patients remained weak and anæmic for a long time.

One sequela was noted which I had never previously seen, namely, Raynaud's disease, or localized gangrene. Four such cases were treated in the hospital, the feet being the parts affected in all of them.

The disease began with acute pain, especially in the toes. Then small patches of dusky erythema, which were exquisitely tender, appeared on the soles of the feet and on the dorsal surfaces of the toes. These gradually deepened until they became of a blackish-slate colour. The patches were rarely larger than a sixpenny-piece and oftentimes smaller. The sloughs slowly separated, leaving a healthy, granulating sore, which healed gradually. To allay pain and irritation and to hasten the separation of sloughs, hot boric dressings were by far the most useful.

From a hygienic standpoint the outbreak of some 20,000 cases of enteric fever during the South African campaign, when every climatic, meteorological and rural condition was hostile to such an occurrence, surely throws into wonderful and vivid relief the record of the Great War, when, in spite of every condition being favourable to it, enteric fever was practically non-existent, thanks entirely to the scientific genius of the Royal Army Medical Corps, which introduced and perfected antityphoid inoculation.

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### Current Literature.

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VON MÜLLER, F. **Observations during the Period of Under-Nutrition in Germany.** *Bull. New York Acad. Med.* 1926, v. 2, 502-16.

Early in the war it was found necessary to introduce rationing of most essential foodstuffs in Germany, and to utilize 90 per cent. of the wheat and rye for bread. By 1916 milk had almost disappeared as a normal article of diet. Of all the restrictions in food, the deficiency in meat was the least important and produced no bad results, but a definitely good one, in that gout disappeared entirely, whilst the uric acid of the blood and urine in the general population fell to half its normal value. (Two years after the war, cases of gout began to reappear.) The average body weight fell 12 per cent. and obese people lost a much greater proportion of their weight, so that real cases of obesity were no longer seen, which suggests that common obesity is due, in the main, to a discrepancy between food intake and expenditure.

The autumn of 1916 proved the worst period. Turnips formed a staple article of diet. Milk was exceedingly scarce, cheese, eggs, and butter were rare, and the potato harvest was very bad. Wasting of the muscles now began to take place, exertion became more difficult, children lost the desire to play, the general body temperature fell below 96·8° F. and the pulse rate to 50-40; the systolic blood pressure fell to 100 and lower. The civilian death rate increased and œdematous swellings of the face and limbs began to be seen. The calorific value of the ration diet was determined by the author and found to be between 1,100 and 960, which is astonishingly low, when we realize that this is a lower figure than the resting basal metabolism. The nitrogen intake was well above the minimum of 3-4 grams a day,

but the nitrogen excretion was found to be even higher than the intake, since the sparing effect of the carbohydrates and fats was insufficient. Increasing the fat and carbohydrate in the diet of the subjects, from whom these data were obtained, re-established nitrogen equilibrium in a very short time. The basal metabolism was found to be reduced by 12-15 per cent., and the lowered vitality which resulted caused a greatly increased mortality (50-90 per cent.) in tuberculosis, in infectious fevers, and after surgical operations.

Starvation lowers, and food raises the production of energy (energy which cannot be used for the production of muscular work). Protein amongst the foodstuffs has the greatest power of specific dynamic action, but the exact mechanism of this process is not yet proved. The author reviews the various theories and facts and inclines to the view that the increase of heat production after food is due to the work of the intermediary chemical transformations of metabolism.

The most important pathological sign in the period of under-nutrition was the hunger oedema, with its pale, swollen and mask-like face. The paleness was due to a hydræmic condition of the blood and not to any serious fall in the number of red cells. The protein content of the blood was very low, down to half the normal, whilst the sodium chloride was extremely high, even up to 0·8 per cent., a condition due to the necessity of maintaining the osmotic pressure of the blood, whose proteins and calcium salts were reduced. Excretion of sodium chloride rose to as much as 40 grams per day, so that there was evidently no kidney deficiency accounting for the oedema. The colour index rose far above 1 and as high as 1·9, whilst the red cells resembled those seen in pernicious anæmia, but the condition had no relation to this disease. During the second half of 1917 the hunger oedema disappeared, as the result of a good harvest of potatoes. An improved diet, in these patients with hunger oedema, caused, at first, a rapid loss of weight due to the tremendous increase in the excretion of urine and sodium chloride. The abundant water in the tissues had to be replaced by fat and the same volume of fat tissue is not nearly as heavy as the same volume of salt solution.

Vegetables were comparatively plentiful and there were no well-established cases of avitaminosis. Fertility diminished and the birth rate fell to half that before the war. The increase of weight in children fell off as much as 4-12 per cent., but the general height was very little diminished (0·75 per cent.). There was some extension of rickets amongst the children and adolescent coxa vara became more frequent. The administration of cod-liver oil supplied the necessary vitamin A [D is probably meant]. The author discusses the chemical nature of vitamin A [D], and its relation to cholesterol, which he considers can be synthesized in the body, since it is so closely related to the bile acids in its chemical constitution.

H. N. H. GREEN.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 10.*

PHELPS, J. R. **Total Fuel Requirement in Health.** *U.S. Nav. M. Bull.* 1927, v. 25, 431-61, 1 chart.

The author has gathered together statistics from many sources relating to the food consumption and minimum calorie requirements in persons of all ages and under different conditions of energy need. He considers that the optimum quantity of food for a given person is an undetermined figure, for so many factors are involved. Protein, for instance, varies greatly in its growth, promoting power, and the extent to which it can be adequately utilized as fuel for work and heat has not really been established. How far can appetite be taken as an index of food requirement? According to CHITTENDEN self-restraint is necessary with an abundance of food, or the the appetite will lead to self-indulgence. A growing child cannot be easily overfed if it eats according to appetite; so BENEDICT concluded from his investigations. The fuel requirement of a boy may easily be 4,000 calories per day, which may represent too much food for his father engaged in moderately active muscular work. The work of CATHCART and ORR, during the Great War, on the calorie needs of the soldier during various items of training is reproduced and is followed by a survey of the U.S. army ration, with which there is some dissatisfaction at present. The cost of the army ration is now 36 cents per day, which is inadequate to provide a properly balanced diet of sufficient fuel value. Fresh green vegetables and fresh fruit are not included in the ration, whilst the allowance of butter and milk is very small; 25 per cent. of the ration allowance may be used for the purchase of desired food, but articles of diet containing abundant minerals, protein of good biological value, and a large vitamin content, are, in the main, expensive and usually of small fuel value. The best form of army rationing would be to have strict adherence to a prescribed ration, with a monetary allowance for extras. Under present conditions there is a wide variation in the variety and quality of the food in different messes, depending on the ability of the cook, the sources of supply, and the skill of the commissary officer. It must be remembered that the calculated food value of a service ration has no very direct bearing on the fuel value of the food issued, consumed and wasted in general messes.

H. N. H. GREEN.

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EDDY, W. H. & KELLOGG, M. **The Place of the Banana in the Diet.** *Amer. J. Pub. Health.* 1927, v. 17, 27-35, 4 charts & 4 figs. [25 refs.]

Experiments were carried out to determine the vitamin content of the banana. Vitamin C was found to be the principal vitamin present, 5 grams of banana per guinea-pig, daily, being the minimal protective dose against scurvy, as compared with 3.5 c.c. of orange juice and 2.5 c.c. of tomato juice. Since cooked bananas are largely eaten, investigation into the effect of baking on the vitamin C content was undertaken, and revealed the fact that

if the fruit were baked in the skin no destruction of the antiscorbutic factor took place, whereas baked without the skin the amount of vitamin C was reduced to one-third its normal value. The retention of the skin probably prevented oxidation during the heating.

A case of infantile scurvy is reported, which treated on milk and banana alone made a complete recovery.

The quantity of vitamin A in the banana, as estimated on rats, was found to be 56 units per ounce. (1 unit of vitamin A. according to the *U.S. Pharmacopœia*, is that required to produce 25 grams gain in 56 days, in 30 days old white rats, fed on a basal diet adequate in all known factors except vitamin A.) This is equivalent to 1-20 the vitamin A value of good butter, which is surprising, in view of the low fat content (0.6 per cent.) of the banana.

The vitamin B present in the banana was found to be fairly small in amount and approximately that of tomato juice.

No evidence of any vitamin D, whatsoever, could be found in the banana.

No work was done on the vitamin E content of the banana, but EVANS and BURR have reported its presence, though not in large amounts.

Bananas have a distinct place amongst fruits and vegetables, in being very rich in utilizable carbohydrate (22 per cent.). Their low protein content (around 1 per cent.) enables a diet rich in carbohydrate to be given without increasing the protein, and this may be of some significance in the treatment of nephritis.

The unripe banana is well known to give rise to digestive trouble, but the explanation is not yet clear. During ripening the starch is converted into sucrose and invert sugar, but LANGWORTHY has shown that raw starch is digestible. LLOYD demonstrated that during ripening the pectose of the banana is converted into water-soluble pectin, but he believes that the unbound tannin in the unripe fruit is responsible for its indigestibility. Practically, this factor disappears with ripening or cooking, and the banana is tolerated at all ages and by invalids of various types. The banana rivals tomato juice and orange juice in infant feeding, on a vitamin basis alone, as it forms an excellent source of vitamins A and C, and a good source of B, though vitamin D has to be added to make the diet complete.

H. N. H. GREEN.

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ANTOINE, G. & WAGEMANS, J. Essai de vaccination "anti-vaccinale" *per os* chez le lapin. [On the Production of Vaccinal Immunity in Rabbits by Means of Orally Administered Vaccine.] *C.R. Soc. Biol.* 1927, v. 96, 720-21.

Three young rabbits were fed with vaccine of known potency administered in capsules, Besredka's technique being followed; other three were

used as controls. Each rabbit received in all about 100 doses of vaccine of known potency. Certain difficulties were experienced owing to the presence of the glycerine and also owing to the rabbit's peculiar method of mastication destroying some of the capsules. None of the rabbits presented any ill effects. A fortnight later both sets of rabbits were vaccinated on the skin of the back with lymph of known potency. The control animals "took" perfectly. Not the slightest change occurred in the skin of the animals which had been orally vaccinated. Further experiments are to be made to ascertain if such cutaneous immunity is part and parcel of a general immunization.

W. McC. WANKLYN.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 10.*

LEAKE J. P., & THOMAS, S. The Vaccination Scar as an Index of Immunity. *J. Amer. M. Ass.* 1926, v. 87, 1125-6. [4 refs.]

The authors, representing the Public Health Service and bacteriological research respectively, have been continuing their attempts to find out how much reliance can be placed on "good scars" as indicators of immunity against vaccinia and therefore against smallpox. They sought to do this by observing the records of "immune reactions" (first suggested by FORCE in 1913—the prompt reaction described by VON PIRQUET) as administrative criteria of immunity. In 1924, 389 scars of men undergoing vaccination on entrance to Lehigh University were thus examined, but the results did not warrant any general statement. In 1925, 874 scars were examined, special observation being kept regarding: (1) location; (2) length and breadth in millimetres; (3) whether pitted or smooth; (4) whether faint or marked. It was concluded that the size of the scar of previous vaccination, the character of the scar (whether pitted or smooth) and the amount of scarring (whether marked or faint) have no practical bearing on a person's immunity against vaccinia or variola.

W. McC. WANKLYN.

*Reprinted from "Bulletin of Hygiene," Vol. 2, No. 10.*



## Reviews.

AN ILLUSTRATED GUIDE TO THE SLIT-LAMP. By T. Harrison Butler, M.A., D.M.Oxon., M.R.C.S.Eng., L.R.C.P. Lond. Oxford University Press. 1927. Pp. xiii and 144. Price 30s.

This excellent book is the first one on the subject by an English author and should appeal to all British ophthalmic surgeons.

The book opens with a description of the Zeiss slit-lamp and microscope, which Mr. Harrison Butler justly states "represents a combination of theory and practice which cannot in the nature of things be found in any of its rivals."

The book is illustrated by its author with many beautiful plates and useful diagrams. Many of the abnormalities may be difficult to see as clearly as they are shown in the drawings, but there is nothing new in this as it is almost always the case that in microscopic work of this class, a complete drawing really represents a picture constructed by the artist out of a series of sectional views, each all that can be seen in one observation, panoramically dovetailed together.

The description of the apparatus is practically complete and its mode of manipulation is so simply and concisely explained that, with the aid of the book, even one who has never handled the instrument before can easily become familiar with the correct technique necessary to see the very beautiful normal and pathological conditions which it reveals.

After describing the appearance of the normal cornea he gives a chapter on localization and measurement in which the various methods of this most important subject are clearly explained. A chapter on abnormalities of the cornea is followed by a discussion of the anterior chamber, inflammation, iris, suspension of the lens, the normal and pathological lens, retro-lental space and vitreous, the effects of operations and injuries upon the eye and the value of the slit-lamp technique applied to simple apparatus.

The significance of increased "aqueous flare," as indicating an aqueous heavily charged with proteins, is emphasized as being the earliest sign of inflammation, and its appearance in the second eye may be the first warning of sympathetic inflammation, subsequently followed by the presence of cells in the aqueous, retro-lental space and vitreous, which may be detected several days before the appearance of the more obvious signs.

The presence of a retro-lental space, as revealed by the slit-lamp, apparently filled with aqueous even after discission, suggests the possibility of needling the posterior capsule without injuring the vitreous and causing its prolapse into the anterior chamber.

Whilst the range of the corneal microscope is limited to a spot about one-third of the distance from the back of the lens to the retina, and thus

often fails to permit examination of tumours, yet the slit-lamp and microscope afford useful information in making a differential diagnosis between an intra-ocular malignant tumour and an inflammatory swelling. The presence of definite signs of inflammation is strong evidence of pseudoglioma, whilst their absence suggests a malignant growth. The author mentions two such cases in which a correct diagnosis was made with the slit-lamp and the microscope.

The value of this apparatus cannot be over estimated in medico-legal cases, and Mr. Harrison Butler believes that it is only a matter of time for a slit-lamp examination to be demanded by insurance companies in compensation cases.

The book is admirable in every way, and no ophthalmic surgeon's library is complete without it. J. P.

**TROPICAL SURGERY AND SURGICAL PATHOLOGY.** By Karuna K. Chatterji, F.R.C.S.I., Major I. T. F. Med. Corps. London: John Bale, Sons and Danielsson, Ltd. 1927. Pp. xxx + 244. 91 Plates and 5 Charts. Price 16s.

The publication of a new book on tropical surgery is an event of interest.

The author is a surgeon at the Medical College Hospital in Calcutta, and the book deals with tropical diseases as found in India, and is, in consequence, mainly of interest to the Indian student.

Tropical surgery *per se* is a limited subject, and therefore pathology is found to play a large part in the volume.

The book is divided into nine sections, which deal respectively with amœbiasis, filariasis, tropical granulomata, schistosomiasis, ascariasis, bones and joints, abdominal surgery, neoplasms, and finally a section devoted to vesical calculi, burns and snake bite.

Amœbiasis is well and fully described and occupies one-third of the book.

The subject of filariasis is beautifully illustrated, and the treatment by preparations of margosic acid described. The author's experience of elephantiasis is large, and the treatment by operation carefully detailed.

A new operation for the cure of hydrocele by an overlapping method in distinction to the excision of the sac is to be noted, and the cure of 225 cases by this method is of interest.

The author is to be congratulated on the excellence of the illustrations, and especially the coloured plates.

**AIDS TO TROPICAL MEDICINE.** By Gilbert E. Brooke, M.A., L.R.C.P., D.P.H., F.R.G.S. Third Edition Revised. London: Baillière, Tindall and Cox. 1927. Pp. x + 228. Price 4s. 6d. net.

This book is a junior member of that numerous and virile family of "Aids" that have long been friends and helpers of harassed medical students. It does not take upon itself the functions of a complete text.

book on a very wide subject, being more in the nature of a summary arranged in alphabetical order and furnished with a complete index. This new edition has been revised to include recent advances in tropical medicine. The Students' Aid Series is valuable in its sphere, and this book resembles its brothers in appearance and size, and is designed to fit the Æsculapian coat pocket.

M. B. H. R.

CONTRACEPTION: ITS THEORY, HISTORY, AND PRACTICE. By Marie Carmichael Stopes, D.Sc., etc. London: John Bale, Sons and Danielsson, Ltd. Pp. xxvi + 480. Price 15s. net.

This is the second edition of Dr. Marie Stopes' book, which was first published in 1923 and reprinted four times. It is intended as a manual for the medical and legal professions. There are no less than five introductory notes, written by eminent people, setting forth the need for more study of the birth control movement among medical men and members of other professions. Dr. Stopes discusses in the most open and simple manner the various methods of contraception, and includes much information concerning the history and the development of the movement.

The subject of Contraception, one need hardly say, is of immense importance, and demands the close attention of medical men, even when it may be distasteful to them. The racial aspects of the problem are much more interesting than the individual application of recently acquired knowledge, and are intimately bound up with the future of Western civilization. Dr. Stopes, with her undoubted literary gifts and clarity of expression, appears to realize that the personal touch is most likely to appeal to her readers, and does not therefore go deeply into the national and racial advantages that birth control is credited with by its supporters. Whatever views people may hold, there is no question that this movement should be more universally understood by the intelligent public, and given more consideration. Dr. Stopes deals very summarily with those who possess reactionary minds, and her literary ability and obvious sincerity of purpose are well employed in defeating the arguments and objections raised by her opponents.

M. B. H. R.

DISEASES OF THE SKIN: A MANUAL FOR STUDENTS AND PRACTITIONERS. By Robert W. MacKenna, M.A., M.D., B.Ch.Edin. London: Baillière, Tindall and Cox. 1927. Pp. xii + 450. Second edition. Price 25s. net.

We welcome a new edition of this well-known textbook on diseases of the skin. It is four years since the first edition was published, and the new one has been brought well up to date.

The introduction of many coloured plates greatly adds to the value of the book.

The latest views on the use of ultra-violet light in dermatology are given,

as also is the use of thallium acetate for ringworm of the scalp, but we must regret that the treatment of lupus erythematosus with krysolgan is condensed into three and a half rather pessimistic lines.

The general practitioner and the student will find this book very readable and the teaching sound. The diagnosis, helped by tables pointing out the differences between the diseases that are most easily confused with one another, is very clear. Treatment, a special feature of this book, is practical and reliable, and prescriptions are given for each disease.

We can confidently recommend those who wish to treat diseases of the skin in an efficient and up-to-date manner to buy this book. The author and publisher are to be congratulated on the excellent make up and an entire absence of blemishes.

F. C. D.

STANDARD CATALOGUE OF SCIENTIFIC APPARATUS, 1927. Vol. III. Biological Sciences. London: Baird and Tatlock (London), Ltd.

We have received a copy of the new edition of Messrs. Baird and Tatlock's Standard Catalogue, Vol. III, Biological Sciences. Most of our readers who have worked in laboratories will know how useful the previous editions have been, and will welcome the publication of a new and up-to-date catalogue. This volume contains 457 catalogue pages, a list of books on biological science and a very complete index. It is, of course, profuse y illustrated with excellent drawings which, together with the specifications, explanations of construction, design and objects of each piece of apparatus, enable the reader to assess rapidly its suitability to his particular requirements. In many cases, more especially those of new or complicated apparatus, detailed instructions for their use are given, and as the catalogue covers not merely Messrs. Baird and Tatlock's own products, but also those of many other manufacturers, it has a very considerable educational value. The book is well bound, with thumb indices to the sections, and altogether reflects great credit on the producers.

BACTERIAL VACCINES AND THEIR POSITION IN THERAPEUTICS. By Leonard S. Dudgeon, C.M.G., C.B.E., F.R.C.P.Lond. London: Constable and Company, Ltd. 1927. Pp. vi + 87. Price 7s. 6d.

This book is one of the series of Modern Medical Monographs. The very comprehensive title cannot be said to have been happily chosen, for, in order to bring the subject within the limits of a small volume, the author has refrained from reviewing the vast amount of literature which has been published, and gives instead his own personal experiences.

A very brief chapter on active immunization is followed by an account of the general principles regulating the production, standardization and dosage of vaccines. The author recommends formalin for sterilizing the bacterial suspensions but does not give his reasons for this preference. This is much to be regretted as formalin is a very active chemical reagent,

known to have a profound effect on certain bacillary products, and it may be necessary to exercise caution in applying Professor Dudgeon's teachings to the use of vaccines killed in other ways. In this connexion it may be noted that he recommends a prophylactic vaccine of *Micrococcus catarrhalis* in a strength of 600 millions per cubic centimetre, which is a much larger number than is usually employed. It is not impossible that in this case the formalin has a definite detoxicating action such as he claims for it in Shiga vaccine.

The remaining chapters deal with the preparation and employment of vaccines in the prophylaxis and treatment of various diseases, among which are included rabies and small-pox.

A page and a half are devoted to Calmette's "B.C.G." vaccine, but no mention is made of Besredka's work on local immunization.

As a summary of the experience and opinions of a well-known authority, the book forms a valuable contribution to the literature on the subject, and it will be found a most useful guide to the medical officer who wishes to employ vaccines to the best advantage. C. J. C.

RESEARCHES IN POLYNESIA AND MELANESIA. By Patrick A. Buxton, M.R.C.S., D.T.M. and H., assisted by G. H. E. Hopkins, M.A., F.E.S., being No. 1 of the Memoir Series of the London School of Hygiene and Tropical Medicine. Parts I to IV (Medical Entomology). London, July, 1927. Pp. xi + 260. Text figures 53 and plates 12. Price 10s. 6d.

This volume, which is divided into four parts, with four appendices and a bibliography, shows that many hours of careful and trying research work have been spent in its production.

The ground covered by the various parts is as follows :—

Part I: Chiefly introductory; also giving a description of the islands visited, with their geography, structure, flora and fauna.

Part II: The climate of Samoa.

Part III: The Medical Entomology.

Part IV: Experiments performed on *Aedes variegatus* and *Aedes argenteus*.

Parts I and II, though of interest, do not concern medical officers as a whole.

Part III deals with field work and gives a very exhaustive list of the insects of medical interest found in the islands, together with such allied groups as the Myriapoda and Arachnida.

It is interesting to note that only two species of anopheles are found in Melanesia, and that though malaria is present in this group it does not occur south and east of the New Hebrides, no anopheles being found in the Loyalty Group, New Caledonia, Fiji, or any part of Polynesia.

The text figures in this part, as elsewhere in the volume, are clearly drawn and produced.

Part IV is divided into five sections dealing with :

- (1) A study of the factors which control egg-laying in *Aedes*.
- (2) A study of the factors which cause eggs of *Aedes* to hatch.
- (3) Experiments with the larvæ of *Aedes*.
- (4) A short note on adults.
- (5) Summary : *Aedes* and its environment.

As the chief reason for which Dr. Buxton visited these islands was connected with the study of filariasis the *Aedes* group naturally called for the most attention.

The various methods employed in these studies are fully described, and should prove of the utmost value to others who are carrying out anti-malarial work or other investigations connected with mosquitoes.

The tables given in this part are clearly produced, all unnecessary matter being rigidly excluded ; their compilation must have entailed much prolonged and detailed study.

The appendices deal with the following points :—

- (1) A comparison of certain climatic elements at the Observatory and the Hospital, Apia.
- (2) Malaria and filariasis in the New Hebrides.
- (3) Is there a general factor tending to cause eggs of *Aedes variegatus* in different experimental pots to hatch on certain days ?  
By J. F. C. Haslam, M.C., M.D.
- (4) Distribution of hatching times of *Aedes variegatus*. By M. Greenwood, F.R.C.P. and E. M. Newbold, B.A., M.Sc.

The plates which are grouped at the end of the volume are clear, and show photographic views of breeding places of the mosquitoes.

Dr. Buxton, Mr. Hopkins and the London School of Hygiene and Tropical Medicine are to be congratulated on producing a most useful and interesting addition to the previous Research Memoirs of the London School of Tropical Medicine, and it is hoped that further additions to the series may soon follow.

J. E. M. B.

ARCHIVES OF NEUROLOGY AND PSYCHIATRY. Vol. ix. Edited by Frederick L. Golla, F.R.C.P. London County Council. 1927. Price 15s.

This volume is a collection of reprints of articles from medical journals. The articles are all papers relating to neurology or psychiatry, and the authors have made use of the Central Pathological Laboratory of the London County Mental Hospitals at the Maudsley Hospital during their investigations, and have been assisted by the Director there.

The Central Pathological Laboratory at the Maudsley Hospital has been newly equipped, and the functions of the laboratory staff are : The investigations of pathological material from the mental hospitals of the London County area, research into the problems of psychiatry conducted

in the laboratory and the tuition and training in scientific pathology of medical officers of the mental hospitals.

In addition to the research work performed by the medical officers of the London County Council, facilities are afforded for workers from other areas.

It will be seen, therefore, that the collection of papers in the volume under review covers a great field of research, and brings to the reader in small compass the results of much labour, of great value to the neurologist and psychiatrist.

The volume contains an acknowledgment of the debt that the laboratory owes to the late Sir Frederick Mott, together with a bibliography of his valuable writings.  
W. L. W.

**THE INJECTION TREATMENT OF VARICOSE VEINS.** By A. H. Douthwaite. H. K. Lewis and Co., Ltd. 1927. Pp. viii + 39. Price 3s.

In this small book the author describes the comparatively modern method of treating varicose veins by the injection of sclerosing substances. Dr. Douthwaite, whose experience is based on over 2,000 injections, claims that all cases of varicosity of the veins of the limbs or anal canal, no matter how severe, can be treated by this method. He cites a few exceptions where injections are contra-indicated. These contra-indications are: Pregnancy, recent or old-standing phlebitis in the deep veins, cardiac disease with loss of compensation, renal disease, uterine fibroids, and during menstruation. The advantages claimed for this method of treatment as compared with the ordinary operative procedures are: Its simplicity, the avoidance of the discomfort of a general anæsthetic and the dangers of post-operative embolism, and the fact that the treatment is ambulatory and need not interfere in any way with the daily work of the patient. It is said that the chemical clot resulting from the injections is firmer and more adherent than a septic clot, and does not tend to form an embolism. Various sclerosing substances have been recommended, and these are all discussed by the author, who has a special preference for the quinine hydrochloride and urethane solution. The method of preparing the solutions and the technique of injection are fully described. The book is well written, and the author expresses himself with great clarity. The work is one which can be confidently recommended to those who are disposed to undertake this method of treatment of varicose veins.

D. McK.

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